How Pornography Consumption Affects the Consumer and a Biblical Response to the Temptations of Modern Sexuality

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Abstract

It has been shown that 93% of boys and 62% girls prior to age 13 have been exposed to pornography (Sabina et al., 2008). Only in the last decade has the ability to view sexual content been made available to almost all groups of society, regardless of wealth or social status. This paper will address this issue by reviewing literature on the neuropathology, sexual dysfunctions, and violent content associated with pornography consumption. Although a significant amount of research has been done on the impacts of pornography, there is relatively little discussion on possible interventional methods. This gap in knowledge will be addressed by exploring a relevant biblical response to the topic.

How Pornography Consumption Affects the Consumer

The consumption of pornography supports a multibillion-dollar industry that has grown exponentially in the last few decades. With the proliferation and widespread use of the internet, access to sexual media has been made available to billions of people around the world. Unsurprisingly, the number of people who engage in the consumption of pornography has skyrocketed. In 2019, a longitudinal study conducted in Poland that analyzed website traffic data saw a 310% increase in online pornography use between October 2004 and October 2016 (Lewczuk et al., 2022). Current estimates gauging the number of individuals consuming pornography are staggering, with 109,012,068,000 videos contributing to a total of 5,517,748,800 hours of pornography being viewed on Pornhub in 2018 (Fight the New Drug, 2019a). This almost inconceivable number amounts to 629,880 years of content consumed in 1 year—and on only one of thousands of pornographic sites.

These numbers have likely increased since 2018 with the onset of a global pandemic. As societies around the world have implemented social distancing, quarantine, and lockdowns, the number of individuals visiting Pornhub increased as much as 61% in some countries (Mestre-Bach et al., 2020). While this data should be interpreted cautiously, with no premature inferences being superimposed on the data, the increase in pornography consumption could provide insight into how individuals respond to the new social environment in the COVID era.

Opinions regarding the impact of pornography consumption vary widely among the scientific community, but because of the novelty of this form of media, the amount of current consumption, and the pathophysiological parallels to addiction, the importance of studying the societal and individual responses to pornography should not be quickly dismissed. This paper

will attempt to accurately discuss these responses and present information on normal neurophysiology, the pathology of addiction, and the sexual violence related to pornography specifically. Next, this paper will discuss the physiological and behavioral effects associated with problematic pornography use (PPU). Finally, a biblical response to pornography will be explored.

Normal Physiology

The brain is the most complex organ in the body, making up only 2% of total mass but using 20% of its daily energy (Swaminathan, 2008). Attempting to cover every aspect of its function would be an exhaustive task. Therefore, this paper will address the physiology of neurons in general, and then discuss the specific areas of the brain most affected by pornography.

Neurons communicate with neurotransmitters. Neurotransmitters are a diverse set of endogenous, neurochemical signaling molecules that are manufactured and secreted throughout the nervous system (Sheffler et al., 2019). Secretion occurs when an electric signal (generated by an influx of ions into a neuron) travels to the junction of two neurons. This junction is called a synapse. When the electrical signal (also known as an action potential) reaches the synapse, neurotransmitter molecules from the presynaptic neuron are released into the synaptic gap—the space between two neurons. These neurotransmitters then bind to specific receptors on the postsynaptic neuron (the neuron being depolarized), and sometimes even to the receptors on the presynaptic neuron (Noble et al., 2015). Different neurotransmitters will stimulate a distinct response depending on the specific receptor to which they bind. Some neurotransmitters excite a neuron by binding to receptors that open ligand-gated ion channels. This leads to a depolarization of the postsynaptic neuron, as positively charged cations enter the cell. If the cell

depolarizes to a sufficient voltage, an action potential is generated and sent down the axon to be delivered to the next cell. Other neurotransmitters inhibit their target neuron by opening chloride ion channels that keep the postsynaptic neuron from depolarizing.

Through this process, electrical signals can be sent from the peripheral nervous system to the central nervous system, allowing the brain to integrate and understand vast amounts of information (Noble et al., 2015).

Specific Neurotransmitters Associated with Addiction

Specific neurotransmitters can directly affect areas of the brain that impact the behavior of an individual (Noble et al., 2015). One such neurotransmitter that plays a vital role in cognitive health is dopamine (DA). In order to adequately discuss the neurological effects of pornography, the function and normal physiology of DA secretion is essential to understand.

DA is a neurotransmitter secreted by dopaminergic neurons and is integral in the brain's reward/pleasure pathway (Thobois et al., 2004). It is important to note that because of the high specificity of the blood brain barrier, DA synthesized from somatic cells cannot enter the brain. Therefore, DA that is used in the brain must be manufactured within cranial tissue. Under normal physiological conditions, DA is synthesized in presynaptic neurons in the substantia nigra with normal concentrations in the brain around 4.8 ± 1.5 nM (Weiss et al., 1992).

Neurons in the midbrain secrete DA into the synaptic cleft where it has an excitatory effect. After fulfilling its role as a neurotransmitter, DA is reabsorbed into the presynaptic neuron via reuptake mediated by either a dopamine transporter or the plasma membrane monoamine transporter (Weiss et al., 1992). These transporters are of particular importance in regulating healthy concentrations of DA in the brain. Besides reuptake, DA can also be broken down into

inactive metabolites. This breakdown is accomplished in most cells by catechol-O-methyl transferase (COMT) and monoamine oxidase (MAO) (Napolitano et al., 1995). However, in dopaminergic cells, COMT concentrations are minimal, and the cell relies on MAO for the majority of catalytic breakdown (Napolitano et al., 1995). The proper maintenance of DA levels in the synaptic gap is paramount to sustaining a healthy reward/pleasure pathway. When normal concentrations are secreted and recycled, the reward pathway functions as it should and allows individuals to think and plan in a beneficial manner.

The area of the brain where most dopaminergic neurons are found is the ventral tegmental area (VTA) located next to the substantia nigra in the midbrain. The VTA is one of the most important locations of the brain to consider when studying activation of the reward system. It is part of the mesolimbic dopamine pathway (Thobois et al., 2004), and the DA secreted here has such a powerful effect that rats will starve themselves and forego food just to receive a stimulus to this area (Stutz et al., 1971). The mesolimbic dopamine pathway carries the DA synthesized in the VTA to the nucleus accumbens and amygdala. The accumbens has been found to play an essential role with the feelings of reward and desire. The amygdala stimulates a variety of emotional responses, such as fear, and plays a vital role in the limbic system (a region of the brain involved in emotional and behavioral responses) (Blaess et al., 2020). Proper functioning of this pathway will result in emotional reactions to external stimuli that motivate an individual towards pursuing beneficial rewards. Abnormalities in these areas can contribute to a variety of pathologies.

In conclusion, brain neurology is reliant upon the continual conservation of homeostasis. When the correct type and concentration of neurotransmitters are secreted, areas of the brain

such as the VTA, nucleus accumbens, and amygdala effectively regulate neurological functions and pathways. Each of these systems work together to provide an individual with the necessary neurology for life.

Defining Terms

Before discussing the pathophysiology of diseases associated with pornography consumption, defining several terms will prove to be helpful. Pornography is notoriously difficult to define, however, the Oxford English Dictionary provides a helpful definition for the context of this paper— "The explicit description or exhibition of sexual subjects or activity in literature, painting, films, etc., in a manner intended to stimulate erotic rather than aesthetic feelings" (Oxford University Press, n.d.). This rather broad definition can include a variety of different erotic material, but for this paper, the distinction between erotic and aesthetic feelings is important to consider.

Pornography addiction is another term that is often used in the vernacular of those studying addiction neurology. However, this paper will employ "problematic pornography use" (PPU) instead of "pornography addiction." While pornography addiction deals mostly with frequency and continued engagement, PPU provides a more holistic definition that better encompasses the physiological consequences associated with excessive pornography consumption. Characterization of the immediate distinction between pornography use and PPU is a topic of much debate. However, Kor et al., (2014) provide a good working definition for PPU. As stated in the article, PPU is characterized by,

> (1) highly frequent, excessive or compulsive behavioral engagement; (2) an appetitive urge prior to engagement in the behavior, with an aim to reach/maintain a positive

> emotional state or to escape/avoid a negative emotional state; (3) diminished self-control over behavioral engagement; and (4) continued engagement despite adverse consequences, which, in turn, leads to significant personal distress and functional impairment. (p. 863)

The pathophysiological effects that will be discussed in this paper are likely present in individuals coping with PPU. Individuals who have not crossed the PPU threshold may not manifest significant pathology, but considering the addictive nature of pornography (Dwulit & Rzymski, 2019; Hilton, 2013; Koob & Volkow, 2016), those consuming pornographic material may be in danger of progressing into more severe, dependent consumption.

Few fields of research are more stigmatized and divisive than the study of sexual addictions. In the last several years, many researchers and those within the general population have tried to link a negative viewpoint on pornography consumption with religious idealism. In other words, some claim that the people who take issue with pornography consumption are those who hold a strong religious bias (Grubbs et al., 2015; Leonhardt et al., 2018; Perry & Whitehead, 2019). However, a growing amount of research has shown striking similarities in neurological responses between compulsive sexuality and other well-established addictive behaviors such as drug addiction (Hilton & Watts, 2011).

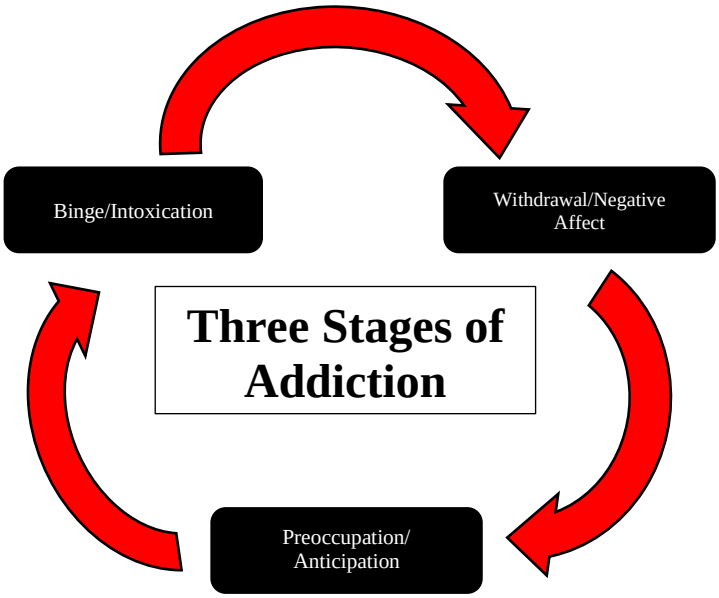
Although the physiological effects of PPU are complex and far reaching, the next section of this paper will attempt to address the most germane aspects regarding pathophysiology. First, the three stages of addiction will be discussed. Then, information on the degradation of the brain's "braking system" and the resulting sexual disfunctions will be presented.

Three Stages of Addiction

A helpful way of studying the pathophysiology of addiction is by separating the phenomenon into a three-stage process. This can be observed in detail in Figure 1. The three stages include binge/intoxication, withdrawal/negative affect, and preoccupation/anticipation (Koob & Volkow, 2016), and must be characterized by a continually worsening affect that is accompanied by neuroplastic changes in the brain's reward, stress, and executive function systems.

Figure 1

Three Stages of Addiction



Note. Adapted from "Neurobiology of addiction: A neurocircuitry analysis," by G. F. Koob and N. D. Volkow, 2016, *The Lancet Psychiatry, 3*(8), p. 761. Copyright 2016 by Elsevier Ltd.

The first stage of the addiction pathway is binge/intoxication and describes changes in dopamine and opioid peptides in the basal ganglia. Through the use of positron emission, it has been shown that intoxicating doses of drugs and alcohol lead to the release of dopamine and opioid peptides in the ventral striatum (Noble et al., 2015). The release of these neurotransmitters is responsible for the pleasurable sensation felt by the individual. This pleasurable sensation can be stimulated by a plethora of different stimuli, including natural processes inherent to human survival such as food and sex (Hilton & Watts, 2011). The fact that natural substances can stimulate the same release of neurotransmitters is particularly important to note because this means that the binge/intoxication stage of addiction can be brought about by substances such as PPU. In addition, this also means that studies conducted with the use of drugs and other addictive exogenous substances can be employed to better understand the effects of PPU.

The binge/intoxication stage in the addiction cycle becomes problematic when it is repeatedly stimulated and is accompanied by the following two phases of the addiction cycle. The withdrawal/negative effect describes the elevation of reward thresholds and occurs when the reward systems in the brain are continually flooded with stimulating neurotransmitters. There comes a point when the activation of the reward system will not occur without a stimulus greater than when the addictive substance was first consumed. One study correlates this stage with a decrease in dopaminergic and serotonergic transmission in the nucleus accumbens (Weiss et al., 1992). Another study in the American Journal of Psychiatry shows that the striatal dopamine responses were 50% lower in detoxified abusers and 80% lower in active abusers for methamphetamine addicted individuals (Noble et al., 2015).

This decreased response could be the result of several different physiological adaptations resulting from cellular exposure to heightened levels of signaling molecules for a prolonged period of time and is important to understand in the context of addiction pathology. One possible adaptation is that of down-regulation, a process characterized by a decrease in the number of neurotransmitter receptors. When this occurs, more neurotransmitters, and therefore a greater stimulus strength, is needed to produce a conducting signal. This process has been observed in dopaminergic receptors (Thobois et al., 2004) and is likely involved in the aforementioned studies.

Another process, called desensitization, also contributes to the decreased response to neurotransmitters. Through a complicated physiological process that is not completely understood, neurotransmitter secretion does not produce adequate signal transduction. Some research suggests that proteins in a downstream pathway are phosphorylated in response to a high level of continual stimuli, which stops signal transduction (Gainetdinov et al., 2004). Other processes also occur but can be very specific to each respective receptor and are not fully understood. However, the effect is the same as down-regulation—more stimulus is needed to elicit a response.

The last stage of the addiction cycle is preoccupation/anticipation. This stage is characterized by a strong craving for the substance/stimulus that results in the actual release of neurotransmitters. Although the processes behind this craving are not well understood, it is hypothesized that the activation of the prefrontal glutamatergic system could be partially responsible for the intense craving (Noble et al., 2015).

Once properly understood, this model of the addictive cycle can allow one to better apprehend the specific pathologies of pornography and the responses of individuals to sexual stimuli. Now that the three-step addiction cycle has been discussed, a closer look into the pathology of PPU will be explored.

Degradation of the Brain's "Braking System"

A specific pathological result of PPU and other addictive behaviors is the neuroplastic degradation of the frontal region of the brain (Hilton & Watts, 2011). The frontal lobes are known as the "braking system" of the brain and are responsible for processing higher order thinking. This contrasts with the reward region of the midbrain (the mesolimbic DA pathway described earlier) that contributes mostly to urges and compulsive behavior. When the frontal lobes of the brain experience a loss of function, the urges of the midbrain are more difficult to control, and the individual often displays detrimental behaviors such as impulsivity, compulsivity, emotional lability, and impaired judgment (Hilton & Watts, 2011). Collectively, neuroplastic changes of the frontal lobes resulting in impaired decision-making are called hypofrontality. This condition can be caused by a number of factors including chemical, anatomical, or pathological changes in the brain (Hilton & Watts, 2011). The detrimental behaviors associated with hypofrontality have been readily observed in individuals who have sustained brain trauma (Hilton & Watts, 2011). Interestingly, in patients diagnosed with addictive disorders, the same behavioral manifestations—aggressiveness, impulsivity, and impaired judgement—are observed. So why do individuals with behavioral disorders display these characteristics?

Pannacciulli et al. (2006) describes a study utilizing MRI technology to look at brain volume associated with obesity. This study found multiple areas of volume loss in obese patients, particularly in the frontal lobes—the area imperative for proper judgment and control. The findings of this study are significant due to the fact that consuming food is a natural action. Sexual arousal (like eating) is also a naturally occurring activity. Therefore, questioning whether PPU contributes to similar volume loss is a valid inquiry.

One applicable German study used MRI technology to determine volume loss among pedophiles (Schiffer et al., 2007). The study found that pedophilia elicited an almost identical anatomical response as methamphetamine and obesity studies, showing that sexual compulsive behavior can lead to real, anatomical changes in the brain. Another study focusing specifically on the effect of internet pornography on the frontostriatal network (the frontal lobe region) describes similar results (Kühn & Gallinat, 2014). 64 healthy male adults reported hours of pornography consumption in a week. The individuals in the study varied greatly in the amount of pornography consumed each week, allowing the researchers to observe any abnormalities associated with high pornography consumption. The results of the study show a negative correlation between the amount of gray matter volume in the right caudate (part of the reward system of the midbrain) and the amount of pornography consumption. In other words, the area of the brain most stimulated by pornography decreased in size in individuals who more frequently viewed pornography.

In an interview that can be seen in the short film “The Brain: How Pornography Can Affect Individuals,” Dr. Kühn says that her original hypothesis was that increased activity in the right caudate would be associated with increased gray matter volume (which is what usually

occurs when an area of the brain is exposed to repeated stimuli), not less (Fight the New Drug, n.d.). Her hypothesis was influenced by the fact that regions of the brain associated with athletic coordination tend to enlarge when an individual participates in sports. So why did gray matter decrease in an area that is significantly stimulated by pornography consumption? As discussed earlier, desensitization and downregulation of neurons can result when the brain experiences excessive stimuli. The brain can be overwhelmed by the overload of information brought about by addictive behaviors.

As a result, desensitization and downregulation can occur as a protective response against such overpowering stimuli. The result is an overall decrease in anatomical size, due to the downregulation of neurons, and a greater need for external stimulation.

In addition, the same German study found that communication between the frontal lobes and the reward system of the midbrain were diminished in individuals who more frequently consumed pornography (Kühn & Gallinat, 2014). To put it simply, the "braking system" provided by the frontal lobe was less capable of controlling the urges initiated by the midbrain. The results of this study may indicate that increased pornography consumption can lead to downregulation of neurons in the underlying brain structure and a degradation to the ability of the frontal lobes to regulate midbrain urges. However, because no subjects in the study were able to be imaged before exposure to pornography, it cannot be definitively stated that pornography caused these conditions. Individuals could have been predisposed to PPU because of innate anatomical abnormalities (decreased brain matter in the caudate region) before they began viewing pornography. However, it is accurate to say that pornography consumption is correlated

with decreased gray matter in the reward center of the brain as well as decreased communication between the reward center and frontal lobe region.

But there are other studies that shed light onto the causality behind the degradation of the brain's braking system. In a two-part study published in the Journal of Sex Research, researchers tested the hypothesis that consuming internet pornography would lead to higher rates of delayed discounting (delayed discounting involves the tendency for people to choose smaller, immediate rewards over larger, delayed rewards) (Negash et al., 2016). The first study involved subjects completing an initial pornography use questionnaire and then performing two delay discounting tasks, each four weeks apart. Individuals who reported unregulated, frequent pornography use demonstrated higher scores in attentional impulsivity, baseline craving, and dysfunctional coping style (Negash et al., 2016). In other words, the subjects who consumed pornography at a greater rate chose immediate rewards over delayed rewards more frequently. However, this did not assign causality to pornography consumption, as individuals who displayed impulsivity could have been naturally predisposed to struggle with regulating pornography consumption before the experiment began. To determine if pornography was the direct cause behind increased impulsivity, researchers conducted an additional experiment. In the second part of the study, subjects were randomly assigned to abstain either from their favorite food or pornography for a period of three weeks. After the testing period, participants who abstained from pornography during the time period showed demonstrably lower delay discounting scores (decreased impulsivity) than those who abstained from their favorite food. In other words, abstaining from pornography consumption was more influential in promoting long term decision making than abstaining from food. These results indicate that pornography consumption was directly

responsible for increased impulsivity and that internet pornography uniquely affects decision making in a manner that is different than other natural rewards (Negash et al., 2016).

So, what are the practical ramifications for these studies? The summation of the previous dialogue indicates that sexual activities elicit extremely similar responses to methamphetamine and obesity (Schiffer et al., 2007), pornography consumption is associated with decreased gray matter and hypofrontality (Kühn & Gallinat, 2014), and pornography uniquely impacts an individual's tendency to choose delayed rewards (Negash et al., 2016). It can be reasonably suggested that the consumption of pornography has an overall detrimental impact on an individual's mental health. Furthermore, the troubling pathological effects associated with pornography, such as decreased gray matter and hypofrontality, should cause healthcare providers to consider the effect of PPU on patients during treatment. The next section of this paper will address another practical implication of the pathophysiological effect of pornography—sexual dysfunctions associated with pornography consumption.

Sexual Dysfunction

In recent years, there has been an increasingly sharp rise in sexual dysfunctions. The term sexual dysfunctions covers a wide range of problems including erectile dysfunction, delayed ejaculation, decreased sexual desire, and diminished libido. Specifically in men under the age of 40, a striking increase in sexual dysfunctions has been observed (Park et al., 2016). In response, researchers have begun to look at pornography as a possible reason for such rapid expansion of men's sexual difficulties in such a short period of time (Park et al., 2016). To better understand this dramatic increase in sexual dysfunction, a closer look into the issue of erectile dysfunction over the last two decades will be examined.

Overview of Pathophysiology

First, it is important to provide a brief overview of the pathophysiology of erectile dysfunction. Several key brain areas are responsible for eliciting an erectile response. The hypothalamic nuclei facilitate erections through pro-erectile signaling from the mesolimbic dopamine pathway, which, as discussed previously, is compromised of the ventral tegmental area and the nucleus accumbens. The mesolimbic dopamine pathway is largely responsible for regulating sexual responses and receives either excitatory or inhibitory signals from surrounding midbrain structures and the prefrontal cortex (Volkow et al., 2011). The stimulating neurotransmitter in this pathway is glutamate, a major excitatory neurotransmitter that is secreted in response to sexual arousal. Glutamate secretion by surrounding nearby midbrain structures then facilitates the activation of dopaminergic neurons, an essential step in penile erection and sexual arousal (Park et al., 2016).

When an individual is continually exposed to excitatory content, hyperactivation of the mesolimbic dopamine pathway can occur. Such is the case with pornography consumption. This continual hyperactivity leads to downregulation of dopaminergic receptors in a process described earlier in the paper. Once downregulation or desensitization occurs, an individual needs a greater excitatory signal (more dopamine secreted) to promote the physiological process of erection. As a result, sexual stimuli that would normally provide adequate arousal for erection is not sufficient and erectile dysfunction results.

Prevalence of Erectile Dysfunction

Now that a general understanding of the physiology behind erectile dysfunction has been explained, the prevalence of this sexual disorder will be discussed as a case study to better understand the dramatic overall increase in sexual dysfunctions at large.

In 1999, a major cross-sectional study found that erectile dysfunction was present in 5% of men, ages 18-59 (Laumann et al., 1999). Three years later, a 2002 meta-analysis reported only a 2% rate of erectile dysfunction in men under 40 (Prins et al., 2002). In contrast, a 2016 study assessing sexual problems in adolescents aged 16-21 found that 45.3% of male participants had problems with erectile function (O'Sullivan et al., 2016). Another study in 2014 on Canadian adolescents aged 16-21 reported that 53.3% of males reported symptoms indicative of sexual problems, with 26.5% experiencing problems with erectile function (O'Sullivan et al., 2014). Considering the young age of participants, it is not unexpected that the researchers in this report were surprised at the widespread prevalence of sexual problems. A final study that again points to a dramatic increase in erectile dysfunction was conducted among Swiss men aged 18-24. 30% were found to have dealt with erectile dysfunction (Mialon et al., 2012). The overwhelming number of studies of this kind demonstrate the dramatic increase in the prevalence of sexual dysfunctions in recent years.

When the erectile dysfunction data was collected in 1999 and 2002, no Internet “porn tube sites” had been available for widespread public use (Sarracino & Scott, 2008). Now, pornography is widely available, habitually accessed, and free of charge, demonstrated by the 42 billion visits to Pornhub in 2019 (Fight the New Drug, 2019b). Because of this strong correlation, many researchers have suggested that frequent pornography use is one of the main causes of sexual disfunctions (Park et al., 2016).

One of the earliest studies to claim that pornography produced low libido and erectile dysfunction was conducted in 2007. Researchers found that individuals from bars and bathhouses where pornography was constantly displayed could not achieve erections in a lab without extreme, specialized content being displayed. (Park et al., 2016). Since this initial study, there has been increased evidence that internet pornography is a contributor to the rise of sexual dysfunctions.

Risk of Violence Associated with Consumption

Throughout this paper, the physiological events contributing to the pathologies associated with pornography have been discussed. When neurons in the midbrain become desensitized and communication between the prefrontal cortex and the reward center is inhibited, impulsive behaviors can be observed (Hilton & Watts, 2011). The general process by which the brain's braking system deteriorates has already been described. In this section, different studies that depict what behaviors result from the deterioration of the braking system will be explored.

Researchers have found that when an individual experiences significant exposure to pornography, an eventual consumption of more extreme sexual content will be observed (Park et al., 2016). If this is true, the proliferation of pornography in the last two decades should result in the widespread availability of violent, extreme content. This is exactly what is happening. One study published in the British Journal of Criminology conducted the largest research sample of online pornography to date (Vera-Gray et al., 2021). The study looked specifically at content that was immediately advertised to first-time visitors on three of the most popular pornographic websites over a six-month period. It was found that one in eight video titles alone shown to first time users included descriptions of violent sexual acts. One of these websites included sexually

violent language in 49.6% of titles. Furthermore, researchers found that violent behaviors depicted on these websites, such as coercion, deception, non-consent, and criminal activity, are presented in a manner that makes these actions seem permissible (Vera-Gray et al., 2021). In other words, graphic, violent content is presented as normal to the billions of viewers visiting these websites.

The extent of violent material present on these mainstream websites dismantles the claim that there is a clear distinction between criminal, niche websites only available on the dark web, and 'safe' websites, free from unlawful content (Vera-Gray et al., 2021). To illustrate this point, the above study identified 2,698 titles that definitively described coercive and exploitive sexual activity among underaged individuals, even with ambiguous terms such as 'young' or 'teen' excluded from the results. As a reminder, this study looked at only three of the mainstream pornography websites over a relatively short period of time. Even with the public statements from these websites prohibiting the depiction of criminal or violent behaviors, the results of this study underpin the validity of these claims. And because of the illegality of underage pornography, every individual who viewed these coercive videos committed a criminal offense.

Sexual Script Theory

The sexual script theory, accepted by many psychologists today, makes the prevalence of violence in mainstream pornography all the more troubling. In psychology, a "script" is a powerful brain pathway that influences how a person interacts in society every day. For example, when a teacher asks a question to a group of students, a script will inform the students that an appropriate response is to raise their hand. The students draw from observations and previous experiences and act accordingly. Sexual script theory employs the same idea to interpret how

individuals develop their understanding of sexuality (Vera-Gray et al., 2021). Observation and previous experiences are used by individuals to determine what is normative sexual behavior. These individuals rely on institutions in society to either stigmatize or encourage what behavior is appropriate (DeLamater & Plante, 2015). Today, millions of developing teens and adolescents around the world are being informed by sexual scripts in mainstream pornography.

The study by Fiona and colleagues suggests that the societal norms surrounding sexual activity are being subversively skewed in a manner that fosters violent behavior. According to this study, many of the sexually violent videos on the site were not clearly labeled (though a sizable number were). Instead of explicit language, many times, even the most serious sexual offenses would be labeled in a manner to make the videos seem 'ordinary' or even 'humorous.' This subversive tactic normalizes criminal content for millions of viewers. Sexual scripts depicting violent sexual behaviors now fill the minds of consumers around the world. The sexual script theory coupled with the already discussed degradation of the brain's 'braking system' amounts to a troubling future for a general population so inundated with pornography.

Unfortunately, the dangers inherently associated with consuming criminal pornographic material can already be observed in a study that describes how individuals may go to lengths greater than the general public believes are comprehendible to achieve a pleasurable experience. In 2008, researchers explored whether "picture only" child pornography offenders would cross over into "hands on" abuse (Bourke & Hernandez, 2009). Two groups of child pornography offenders were studied—one group was only charged with distribution or possession of child images, while the other group had documented "hands on" abuse. The aim of the study was to

determine if the subjects in the first group were simply image only offenders, or if their behavior had led to a greater offense.

Originally, 74% of 155 subjects had no "hands on" documentation. At the end of the study, 85% of subjects admitted to hands on abuse, and just 2% passed a polygraph test (Bourke & Hernandez, 2009). The fact that only 2% of participants were able to definitively defend the "picture only" abuse status is incredibly concerning. The number of individuals admitting to "hands on" abuse clearly depicts the tendency for individuals to progress into more extreme content, and shows the incentive salience and reward deficit seen in the three stages of the addictive cycle.

In the same study, a high amount of "crossover" between age and gender occurred among child abusers. Nearly two thirds of participants admitted to abusing both pre-pubescent and post-pubescent victims (an increase of 52% of what was known prior to the study). Additionally, 40% of the admitted child molesters reported abusing both male and female victims. This response is consistent with the tendency for individuals experiencing hypofrontality and increased midbrain compulsion to engage in novel, more extreme activities in an attempt to stimulate their deteriorating reward pathway. Researchers go so far as to question whether clinicians should even distinguish between "child pornographers" and "child abusers" and even "pedophiles" (Bourke & Hernandez, 2009). While they admit that it is possible for some individuals to view child pornography and not experience these physiological effects, Bourke and Hernandez (2009), also claim that,

> We have not encountered such individuals in our clinical practice. In our work with these offenders, we have found that exposure to child pornography, as well as the cultural and

> technological context in which it is exchanged, has an insidiously deleterious effect on them. (p. 188)

However, not everyone views child pornography in the same manner. Recently an article in USA Today describes pedophilia as one of the most misunderstood conditions in modern society. (Dastagir, 2022). The article went so far as to claim that when researchers use the term pedophilia to include action, it fuels misperceptions. This sentiment is completely contradictory to the above study in which researchers suggest that those who view child pornography are always afflicted with a deleterious consequence. The de-stigmatization of child pornography and pedophilia at large is a dangerous development. With the increasingly high level of pornography consumption currently present in society, the acceptance of more "hardcore" forms of pornographic material will likely continue.

A Biblical Response

This paper now comes to the intersection between two fields of study—science and theology. The distinction between the two fields has not always been so explicit. Thomas Aquinas described theology as the "queen of sciences" (Oliver, 2016), and his assertion remained popular for centuries. In recent years, correlating with the rise of secularism, an attempt has been made to subjugate theology in favor of 'modern science.'

However, specifically regarding the issue of pornography, modern science alone does not, and indeed cannot, provide adequate answers. None of the articles describing pathologies of pornography consumption in this paper provide an objective standard of treatment. One study investigated whether a serotonin-reuptake inhibitor could be used to treat patients with PPU (serotonin is an inhibitory neurotransmitter that could theoretically diminish the efficacy of

dopamine stimulation) (Gola & Potenza, 2016). However, after initially promising results, the treatment ultimately failed to reduce pornography use and associated anxiety, and instead led to renewed compulsive consumption after three months. Other treatments described by the popular website "WebMD.com" featured non-traditional methods such as hypnosis and Cognitive Behavioral Therapy, though when considering the number of individuals consistently viewing pornography, and the general population's hesitancy towards hypnosis, these methods may not be largely effective. Other methods such as utilizing group therapy and finding substitutionary alternatives were also promoted and have reportedly more encouraging results (Kashyap, 2020). Interestingly, these latter methodologies are biblical principles that will be discussed shortly.

So, what can those who are struggling with pornography consumption do? The conclusion of this paper will assert that an effective response to the urge to view pornography will include the following: (1) A realization that pornography is morally wrong, (2) An understanding of the danger consuming pornography entails, (3) A continual meditation on the beauty of God, in contrast to the appalling foulness of sin.

A Realization That Pornography is Morally Wrong

In a time when a single mainstream pornographic website has over 42 billion views in a single year, promoting the idea that pornography is morally wrong is not going to be a popular endeavor. But to the Christian, who builds his view of morality with the scaffolding of biblical commands, this is exactly what a biblical response necessitates, evidenced by clear commands in the Old and New Testament. In the Sermon on the Mount, Jesus says, "But I say to you that everyone who looks at a woman with lustful intent has already committed adultery with her in his heart" (*English Standard Version Bible*, 2001, Matt. 5:28). Adultery was considered one of

the most severe transgressions in biblical times, and while internet pornography was obviously not present during the time of this statement, the principle has not changed. One can clearly see that Jesus teaches his followers that viewing another individual as a mere object of sexual pleasure is morally wrong.

In addition, the prevalence of sexual violence in mainstream pornography should be a cause for concern. Coherent views on morality condemn sexual violence and the suffering that it brings. Besides the personal implications of desensitization to this content, supporting an industry that promotes dangerous sexual scripts is not compatible with a biblical worldview.

An Understanding of the Danger Consuming Pornography Entails

While this paper has already covered the physical dangers of pornography consumption, this section will deal with the spiritual danger associated with sexual sin, specifically for the Christian believer. Much of the following content will be influenced by John Owen's marvelous book entitled *The Mortification of Sin,* first published in 1684. The first passage of Scripture that will be considered is James 1:15 which reads, "Then desire when it has conceived gives birth to sin, and sin when it is fully grown brings forth death" (*English Standard Version Bible*, 2001). The ultimate consequence of sin, including pornography consumption, is spiritual death. Just as there are multiple symptoms in the progression of a disease, there are also 'symptoms' in the progression to spiritual death. One such symptom is what Owen (1684) calls the "hardening" of the heart (p. 71), a term he borrows from Hebrews 3. Owen (1684) writes, "Take heed, this is that thy lust is working towards— the hardening of the heart, searing of the consciences, blinding of the mind, stupefying of the affections, and deceiving of the whole soul" (p. 71). In other words, individuals involved in sin are in danger of losing the ability to recognize the signs of

death. Today, we can see this pattern illustrated in the midbrain/frontal lobe interaction. As observed in the study by Kühn and Gallinat (2014), the ability for the frontal cortex to regulate midbrain urges diminishes with frequent pornography. This process is a striking demonstration of the truthfulness of Scripture.

Another sign of encroaching spiritual death is what Owen (1684) calls "The loss of peace and strength all a man's days" (p. 72). When an individual continually indulges in pornography consumption, he loses the main purpose of his life—to glorify God and enjoy Him forever (Westminster Assembly, 1646). Pornography steals the joy of living. Sex, which God designed to be a beautiful connection between a man and woman, is distorted. Erectile dysfunction resulting from problematic pornography consumption is a perfect example of this principle. In the study by Park et al. (2016) discussed earlier, the authors looked at a case study involving a patient with erectile dysfunction and stated,

> With respect to our servicemen's contact with partners, it is possible that as they sensitized their sexual arousal to Internet pornography, partnered sex no longer met their conditioned expectations and no longer triggered the release of sufficient dopamine to produce and sustain erections. (p. 10)

Rules set forth in the Bible are not arbitrary but have been commanded for a reason. When an individual indulges in sin, instead of lasting happiness comes severe consequences, as seen in James 1.

A final danger to consider is the possibility of eternal destruction. Owen (1684) states the danger plainly, "there is such a connection between a continuance in sin and eternal destruction" (p. 74). Passages in the Bible such as Hebrews 3:12, 10:38, and Galatians 6:8 all point to the

destruction that sin leads to. To again quote James 1:15, “Then desire when it has conceived gives birth to sin, and sin when it is fully grown brings forth death” (*English Standard Version Bible,* 2001).

When one is consistently indulging in pornography consumption there remains no assurance of salvation (I John 3:8), no fellowship with God (Isaiah 59:2; I John 3:9), and a danger of death brought about by sin (Hebrews 10:26-27) (*English Standard Version Bible,* 2001). As Owen (1684) implores, consider these dangers to their fullest extent. “Consider them until they have a powerful influence upon thy soul—until they make it tremble.” (p. 76) However, an effective biblical response does not solely warn the dangers of sin. As seen in the discussion on the three stages of addiction, the development of shameful, negative thoughts in isolation has a detrimental effect and can lead to a reentrance of the addictive cycle (Koob & Volkow, 2016). There needs to be a hope of renewal—something to look to when the temptation to indulge seems overpowering. To find this hope, the third biblical response will be considered.

A Continual Meditation on the Beauty of God, in Contrast to the Appalling Foulness of Sin

In the words of the famous hymn entitled, “Turn Your Eyes upon Jesus” the essence of this response is beautifully depicted. “And the things of earth will grow strangely dim, in the light of His glories and grace” (Lemmel, 1922). To put it simply, one must love God more than he loves porn. The writer of Hebrews beseeches readers in chapter 12, “And let us run with perseverance the race marked out for us, fixing our eyes on Jesus, the pioneer and perfecter of faith. For the joy set before him he endured the cross” (*New International Version Bible,* 2011). How did Jesus endure the cross? He did it by looking to the joy set before him. So must the Christian focus on the joy that is available to the one who hopes in Christ.

As cited in Kashyap, (2020), therapist Jacob Kountz tells readers, “One of the most effective treatments for porn addiction is the process of finding something that is more worthwhile” (para. 16). This sentiment is exactly right. For an individual to discontinue the consumption of pornography, there must be something better, something that evokes more happiness than the fleeting pleasure that pornography brings. For the Christian, what better place to look than the heart of Christ Jesus.

In a sermon by Jonathan Edwards (1740), one of the greatest American theologians of all time, he calls on his audience to love Jesus more than anything else in this life. “The love and grace that Christ has manifested does as much exceed all that which is in this world as the sun is brighter than a candle” (p. 171). What Edwards is saying here is simple— meditating on the person of Christ will bring the Christian more joy than any other possible activity known to man. When a person truly begins to understand the sacrifice of Jesus towards the church, and what it cost the God of the Universe to dwell in a real human body, pornography loses its luster. Jesus willingly endured the cross—an instrument of death designed to impart horrendous suffering, all while taking on the unthinkable weight of God the Father’s wrath. Motivated by love, it was his plan from the beginning of time (*English Standard Version Bible,* 2001, Ephesians 1:4). For the one who believes in this sacrifice, and Jesus’ power over death manifested in the resurrection, there awaits an inheritance of absolute happiness (*English Standard Version Bible,* 2001, Ephesians 1:14). Meditating on what Jesus has done is the ultimate substitute for the fleeting pleasure pornography brings. Fixing one’s eyes on him is truly and wholly “something more worthwhile.” The things of earth grow strangely dim in comparison to the treasures promised by Christ.

However, there may be some individuals who will try these responses and fail to achieve success. This brief overview of a biblical response is not meant to be a comprehensive methodology that will liberate any individual from the urge to view pornography. Many times, additional factors must be employed, such as fellowship with people who promote healthy living or even medical treatment. But, if an individual follows the three responses described above to the fullest extent, success will occur. The problem does not lie in biblical principles themselves, but in man's inability to accomplish them. Hopefully, future research will be conducted that incorporates both modern scientific advancements and proper theology. Pornography is not going away anytime soon, but by responding in a biblical manner, individuals can find ways to pursue healthy sexuality.

Conclusion

Pornography is a world-wide phenomenon that has increased dramatically over the last decade. The effects of pornography consumption are widespread, and this paper covered only some of the main physiological and behavioral consequences. While the cause of pathologies such as hypofrontality, erectile dysfunction, and violent sexual behavior are hard to directly identify, the correlation of these problems to pornography should not be overlooked. The increasing number of people consuming pornography coupled with the violent sexual content that is readily available on mainstream pornographic websites should be a major cause of concern for researchers, healthcare providers, and the general population. Hopefully, increasingly effective treatments that incorporate biblical perspectives will be promoted by social institutions. Only in this manner can lasting change occur.

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