Spring 2022

The Effects of Social Media on Anxiety, Reward Sensitivity, and Risk-Taking on Emerging Adults

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THE EFFECT OF SOCIAL MEDIA ON ANXIETY, REWARD SENSITIVITY, AND RISK-

TAKING BEHAVIOR ON EMERGING ADULTS

A Thesis Presented to the Graduate Faculty

of Fort Hays State University in

Partial Fulfillment of the Requirements for

the Degree of Master of Science

by

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ABSTRACT

The increasing popularity of social media has led to 3.80 billion social media users worldwide (Kemp, 2020). The conception of social media has brought positive and negative effects to light. A tool originally intended to provide connection and build relationships has now also been described by many as a tool for bullying, peer pressure, mental health issues, and unrealistic views of others (Valkenburg & Peter, 2009). Research has shown a significant relationship between levels of social media usage and the likelihood for young adults to have increased reward sensitivity, risky behaviors, and anxiety levels (Vannucci et al., 2017; Vannucci et al., 2019). Although these negative elements can impact people of any age, it has the greatest effects on developing brains. These effects have a neurobiological explanation that can be attributed to the incongruent development of several neural structures and pathways associated with complex cognitive behaviors (Dahl, 2004; Steinberg, 2008). The present study aims to analyze the effects of social media on developing young adult brains, specifically in the context of anxiety, risk taking, and reward sensitivity. Findings from the study will be used to determine if there is a significant relationship between social media and the systems of anxiety, risk, and reward.

ACKNOWLEDGEMENTS

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INTRODUCTION

As of January 2020, it was recorded that 3.80 billion social media users were active worldwide with the number increasing 9% (321 million new users) from January of 2019 (Kemp, 2020). American internet users are also reported to spend upwards of an average of six hours on the internet with more than a third of that time spent using social media. The Pew Research Center (2021) discovered young adults (18-29 years) are among the highest contributors to social media usage. TikTok, Instagram, and Snapchat appear to be the dominant and preferred forms of social media among this age group, specifically ages 18-24, with over 50% using these platforms. As the social media landscape continues to advance and as the age of access to these services becomes lower, it is important to continue to monitor the trends that occur in conjunction with these developments. The prevalence of social media has created both positive and negative outcomes. The benefits range from self-expression and connections with friends and family to entertainment and quick access to news and information, whereas the negatives include bullying and unrealistic social comparisons (Valkenburg & Peter, 2007).

These adverse outcomes have the potential of causing an array of mental health issues (Valkenburg & Peter, 2009). The presence and popularity of social media suggest that this realm of technology does not appear to be going away in the near future. Therefore, it is critical that extensive research on the effects of social media analyze its impact both now and in the future. As technology advances, social relationships have shifted to the online world for connections and interactions with others. Multiple social networking sites offer users the opportunity to become "friends" or "followers" with other users to observe their content. As users' number of friends climbs higher, it becomes more unlikely that users are able to have strong and meaningful relationships with every single one of their "friends" and sparks debate about whether the

prevalence of online relationships makes teens and young adults more or less social than previous generations (Valkenburg & Peter, 2007).

It is a common belief that humans become wiser with age. Although this is often attributed to the collection of life experiences, it may also stem from a result of biological experiences that the brain undergoes as it changes vastly over time. It is widely understood that peak brain development occurs within the first decade of life; however, a second round of fundamental morphological brain development seems to begin in adolescence and end in young adulthood, making this period just as significant. In 2012, Giedd and colleagues discovered that the brain experienced another growth spurt before the start of puberty. The growth of the brain in adolescence is much similar to the growth of the brain in infancy in that there is an overproduction of synapses. With the overproduction of synapses also comes the process of pruning that takes place for a second time in adolescence. Connections that are no longer in constant use are pruned to strengthen the remaining connections and thus allow the brain to become further specialized

The journey to reach the adult brain continues into the second decade of life in which the prefrontal cortex is still undergoing changes (Giedd, 2012). This is a particularly interesting finding because of the role the prefrontal cortex plays in decision making, control, mood, and organization. As this area of the brain continues to mature, individuals are more likely to make better decisions, control impulses, and reason better. During puberty, subcortical gray matter structures that are involved in decision making and reward systems are experiencing a shift. In addition to the numerous physical and morphological changes occurring in the brains of young adults, external sources may impact the connections being set in place during this time.

There is currently a gap in research surrounding the development of emerging adults. They often fail to fit into specified categories associated with either younger adolescents or adults. Adolescents and children are expected to be enrolled in education systems and live with family members, whereas adults have societal expectations of full-time employment, serious romantic relationships, and starting a family. Emerging adults exist at varying degrees of societal expectations as they transition their roles from adolescence to adulthood. Additionally, emerging adults are an interesting population to study as they are one of the first generations to be born in a digital world (Prensky, 2001a). They may also be more vulnerable to poor mental health and increases in risk and reward behavior as a result of entering new and unstructured environments.

Although the brain is adapting to prepare for a new, adult environment, it also has the ability to make individuals more susceptible to take risks, seek rewards, develop addictions, and have disruptions in emotional systems (Chambers et al., 2003; Dahl, 2004; Galvan, 2010). The effect of social media on the developing brains of young adults and the role it may play in risk-taking, reward sensitivity, and anxiety becomes increasingly important to determine during times of rapid brain development. This literature review will first discuss the prevalence of social media and how it is used among young adults, followed by a discussion of adolescent and young adult brain development and how that contributes to risk and reward behaviors, as well as anxiety. The relationship between reward and risk-taking will also be discussed separately. Social media's role in these characteristics will then be discussed and the impact it has on young adults through these developmental changes.

Social Media Use Among Young Adults

Social media is a term used to encompass social interactions that take place over online platforms where individuals have the opportunity to produce, share, and exchange content with

others. Social media is also quite often used interchangeably with the term social networking site, which is a platform in which participants have uniquely identifiable profiles with data and information supplied by the user (Boyd & Ellison, 2007). These users can make public connections that can be viewed by others, as well as have the ability to consume, produce, and interact with streams of user-generated content. The evolution of technology has allowed all generations the ability to easily access these social media platforms with the effects of social media only beginning to be known.

The Pew Research Center (2021) discovered that 84% of American adults aged 18-29 have at least one social media account. Additionally, 85% of young adults reported using six or more social media sites almost daily (Villanti et al., 2016). Not only is there a larger proportion of young adults than older adults on social media, but younger adults also spend more time using social media with an average of three hours daily (Ilakkuvan et al., 2019). The introduction and prevalence of smartphones make social media easily accessible to have the functioning power of a computer in a portable equivalent with 87% of young adults reporting access to a smartphone (Villanti et al., 2016). These statistics demonstrate the pervasive and impactful relationship between young adults and not only social media but technology as a whole.

Although there are a wide variety of social media applications, there are four platforms that appear repeatedly throughout research: Instagram, Snapchat, Twitter, and Facebook. Instagram is a photo and video sharing service in which users are able to develop and curate profiles by posting on the platforms in which other users can comment and/or "like" a picture. Users can also "follow" accounts to stay up to date on the posts of others. Facebook is similar to Instagram in that users have the ability to create a profile and share photos, videos, and worded messages. Facebook users are also able to add "friends" to their profiles, which are similar to

followers and allow users the ability to maintain updates with their "friends". Twitter is classified as a microblogging site that allows users to compose "tweets", or messages, with 280 characters or less. Users can follow other platform users and like, comment, and retweet other users' comments.

Twitter, Facebook, and Instagram all have privacy settings in which, if users choose, they can set who may have the ability to access and see their posts. Snapchat is a photo-sharing, as well as an instant messaging application, in which users can send "snaps" either in the form of word messages or pictures that disappear in a specified amount of time by the sender. Snapchat contains filters to change how the individual and the image appear. Additionally, Snapchat allows users to upload "stories" in which all users that are friends with the user are able to view the story until it disappears in 24 hours, or the owner of the story removes it. A newer form of social media known as TikTok is a video-sharing site that has gained great momentum in the last few years and little research has been conducted on the relationship between teens and the platform because of the recent surge in popularity.

As age increases, it has been found that fewer social media accounts are expected to be in use. Older people have fewer social media accounts than younger individuals and tend to have one preferred form of social media (Hruska & Maresova, 2020), whereas 18–29-year-olds have several preferred forms of social media platforms with a majority of this age group using TikTok (50%), Instagram (71%), and Snapchat (65%) (Pew Research Center, 2021). All research surrounding young adults and social media seem to converge on the generalization that social media does amplify emotions; however, the research differs on whether it is a mechanism that yields positive or negative consequences.

With the wide variety of applications available, it is meaningful to understand the reasons behind the use of social media and what effect it can have on individuals. A Swedish study surveyed 1011 Facebook users and found that 67.1% of young users use Facebook to pass time (Denti et al., 2012). Additional options for uses of Facebook included tagging people in pictures, visiting profiles, reading status updates, and uploading pictures. This finding suggests that a majority of young users are not using Facebook to positively foster and cultivate relationships but rather as a form of amusement to consume time.

Much like the varying body of research on the topic, young adults also have differing opinions on whether they feel as if social media has had a positive or negative impact (Pew Research Center, 2018). Benefits of social media include connecting with friends and family, ease of access to news and information, entertainment, and meeting others with similar interests amongst several other reasons. It is suggested that social media has the effect of allowing individuals to feel more connected to events in the lives of those around them and make social connections. Interestingly, only individuals who had strong social relationships in the offline world were able to amplify relationships via the internet (Valkenburg & Peter, 2007). However, in a study conducted two years later (Valkenburg & Peter, 2009), individuals who had weaker social skills were more likely to benefit from online relationships as the virtual environment may take away anxieties that accompany real-life interactions.

Commonly reported negative effects include bullying and spreading of rumors, unrealistic views of others' lives, peer pressure, addictions, mental health issues, and the ability to harm relationships due to lack of in-person contact (Valkenburg & Peter, 2009). These negative effects can result in mental health disorders, especially in developing populations as they are undergoing many neurological changes in areas of emotion regulation. Research showed

that the content of social media posts has the potential to increase social comparisons leading to a lower sense of well-being and self-esteem, as well as anxiety and depression (Denti et al., 2012). A majority of the negative and positive implications arise from the content of the posts created as opposed to direct messaging on these platforms (Valkenburg & Peter, 2009). High exposure to digitally edited pictures can lead to negative social and body image comparisons. Not only can these comparisons create a negative self-body image but may also cause anxiety attempting to create an appearance believed to be suitable for online (Boursier et al., 2020). Additionally, users see carefully curated profiles of individuals posting pictures of travel and daily life. These profiles may lower wellbeing and create feelings of jealousy and discouragement when comparing one's personal lifestyle to a lifestyle observed online.

There have been several gender differences found in regard to content posted on social media. Males and females post relatively similar numbers of photos with their families, whereas females post pictures of their faces more often than males (Zheng et al., 2016). This may stem from the knowledge that females are more likely to develop problematic behaviors in activities involving social interaction, whereas males prefer to engage in solitary activities like video gaming. The prevalence of problematic social media use can lead to an increase of negative consequences and is more problematic among females. It is suggested that the tendency for females to post more pictures of themselves may be a predictor of levels of narcissism. Females with narcissism are more likely to behave aggressively online and take provocative photos to increase their own self esteem. Both behaviors increase the risk of being victimized, gaining unwanted attention and being objectified online (Grogan et al., 2018). Social media is both a useful tool and a damaging one that can affect mental health and systems related to risk and reward. However, social media is not solely responsible for the increase of risk in young adults.

Risk Taking

Adolescents and young adults are more likely than any other age group to engage in risky behavior, particularly 18-21-year-olds (Steinberg, 2008). These risky behaviors include engaging in the use of alcohol, tobacco and other drugs, unhealthy dietary behaviors, inadequate levels of physical activity, and behaviors resulting in violence or unintentional injuries, as well as sexual behaviors resulting in unintended pregnancies and sexually transmitted diseases (The Center for Disease Control and Prevention, 2020). These violent and unintentional injuries include automobile and various other accidents that account for almost half of all American youth fatalities (Blum & Nelson-Mmari, 2004). Prevention surrounding risk-taking in young adults constitutes a large portion of risk related research as these tragedies are often preventable. There is conflicting evidence on the function of these programs and whether they are effective prevention programs. Many studies analyze risk taking in young people as these behaviors may carry over into adulthood and contribute to fatality rates. However, little research has been done in the area of how social media may contribute to these behaviors in young adults.

The CDC conducts a Youth Risk Behavior Surveillance System (YRBSS) every other year with the most recent version of the survey having been conducted in 2019. The survey monitored four areas of risky behavior that contribute to death and disability in young lives: sexual behavior, high risk substance use, violent experiences, and mental health, which includes suicide. Over the last ten years, fewer students were engaging in sexual activity and illicit drug use. However, illicit drug use has only declined in White and Hispanic populations with the use among Black students remaining the same from previous surveys. In terms of experiencing violence among teens, the data fluctuated from previous findings. It is reported that almost twice as many female students experience cyberbullying when compared to their male peers (CDC,

2020). Mental health and suicide rates are concerning as they indicated an increase in trends for factors related to mental health and suicide. Although this data does not encompass all ages of young adults, it is important to note that these behaviors may carry into adulthood, making it relevant to understand in the young adult population. Currently, there is little research on explanations behind the causes of these increases and what may have happened within the decade following the 2009 study that led to increases in mental health, violent experiences and sexual behavior.

Additional demographic factors, such as ethnic minority groups, may increase vulnerability to engaging in risk-taking behavior. Emerging adults from the Hispanic population were more likely to have unprotected sex and had increased rates of suicidal ideations and attempts (Finer & Zolna, 2011; Gomez et al.,2011). Additionally, Hispanic and Asian Americans who had difficulty with acculturation and experience discrimination were more likely to drive drunk and attempt suicide (Gomez et al.,2011).

The consistent prevalence of risky behavior in the emerging adult population sparked interest over the last several decades. Early research in the area of risk-taking hypothesized that young adults, spanning the ages from 18-24, took significantly more risks than any other age groups on the self-reported grounds of being unaware, unconcerned, or believing they would not be in danger (Steinberg & Cauffman, 1996). However, this hypothesis has been dismissed by data that shows developing adults have similar risk-perceiving abilities to adults and were able to evaluate risky situations as adults (Beyth-Marom et al., 1993). This led to the question of why young people are continually participating in risky behaviors when they are aware of the risks and consequences associated with them. To better understand the reason for risky behavior in

young adults, researchers began to consider socioemotional factors to investigate why young adults continue to make these decisions despite the awareness of the risks.

Considering social factors, peers are a significant factor in young adult risk taking behaviors. Adolescents and young adults spend more time with their peers than any other age group and are more conscious of what others think of them (Gardner & Steinberg, 2005; Chein et al., 2011). This observation has led to the creation of the term "peer pressure", defined as the direct or indirect influence of peers on people. The influence derives from the belief that individuals need to take part in certain behaviors to be liked or respected by peers. These peers are typically members of social groups with similar interests, experiences, or social status (Merriam-Webster, n.d.). A current debate in the area of risk taking is centered around whether young adults participate in risky activities in groups more often with peers than their adult counterparts as a result of peer influence or simply because young adults spend more time with peers than adults do (Brown, 2004).

Positive forms of peer pressure push friends to study or encourage them to join after-school clubs. However, peer pressure is often referred to in a negative connotation, used to describe how individuals may be encouraged to engage in risky behavior like stealing, drug use, or unsafe driving behaviors. Young adults are more likely to engage in risky behavior with peers compared to when alone, including experimentation with drugs, alcohol, and cigarettes (Reniers et al., 2017). For example, undergraduate students are more likely to consume alcohol as a result of peer influences and being away from family. Alcohol consumption can lead to serious long-term health risks, such as addiction, as well as direct risks related to substance use and drunk driving (Karam et al., 2007). As mentioned earlier, auto accidents make up a large portion of young adult fatalities, yet young adults are more likely to take driving risks with friends—and

the risk of accidents significantly increases when a passenger is present (Chen, et al., 2000; Gardner & Steinberg, 2005). An additional study utilized a driving simulation to measure the effect of peers on risk decisions, adolescents increased their risk taking when their driving was observed by peers. However, adults showed no difference in risk taking regardless of peer observation during the simulation. Interestingly, young adults showed little significant differences from both adolescents and adults.

When compared to other age groups, younger adults weigh social risk, or social rejection, as a much stronger factor in decision making than potential health and/or legal risks (Blakemore & Mills, 2014). This can most likely be attributed to how rewarding social relationships are in the lives of young adults and how this reward increases their likelihood to take risks.

Reward Sensitivity

Current research within the area of developmental neuroscience suggests that risk taking leads to increases in reward activation (Steinberg, 2010). Specifically, sensitivity to rewards increased during early adolescence until the age of 16, at which point it begins a steady decline until the mid-20s, whereas impulsivity rates remain relatively constant at different age groups. This finding sets young adults apart from other age groups as it is hypothesized that they respond to rewards differently. However, much like other age groups, young adults find relatively similar areas rewarding such as gustatory, thrill-seeking, and monetary rewards. This seems to be one of the few similarities between the reward processes of adolescents and adults as many differences can be found.

One difference between developing adults and adults is that developing adults find social interactions more rewarding than adults but not more than younger adolescents. Social interactions, especially prosocial behaviors, elicit rewarding brain hormones that affect reward

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circuitry (Insel, 2003). Using brain imaging methods, research showed that older adolescents had similar levels of activation in reward circuitry to positive social feedback compared to adults (Gunther Moor et al., 2010). However, individuals with social anxiety showed greater increases in activation for positive social feedback when compared to negative feedback. This evidence and similar evidence suggest that young adults may take risks in an effort to increase positive social feedback. An additional study highlighted the difference between adolescence and emerging adulthood in response to social rewards. Emerging adults displayed lower levels of response when compared to adolescents, yet they displayed elevated monetary reward response levels when compared to adolescents (Ethridge et al., 2017).

There is a strong association between the risk and reward systems in all humans. People are more likely to take risks when there may be a reward or if the risk will pay off. The sensitive nature of the reward circuitry, as it is undergoing neurodevelopmental changes, leaves it highly susceptible to the effects of social stressors and drugs. A recent animal study of young adult mice analyzed the effect of social isolation on reward circuitry (Burke et al., 2017). The findings show that isolated mice are more likely to prefer cocaine than those not isolated. These stressors caused the mice, whose neurodevelopment is similar to that of humans, to increase their response to drugs as a reward. This suggests that social stressors, such as isolation caused by peer rejection or home experiences, can heighten drug use as a result of anxiety-inducing stressors. These results also indicate that adverse experiences that take place in young adulthood could increase the risk for addiction and mental health disorders such as anxiety in developing adults and adults.

Anxiety

Anxiety disorders are a broad category that not only encompass generalized anxiety disorder, but also includes panic disorders, social anxiety, and various phobias that interfere with daily life. It is important to understand the difference between normal levels of worry and the anxiety that impairs daily functioning. Worrying can fit into the criteria for an anxiety disorder when it becomes excessive and lasts for at least six months (National Institute of Mental Health, 2013). The fear and anxiety can stem from any number of situations such as home/work life and social interactions. These preoccupations can manifest into mental and physiological symptoms like sleep difficulties, trouble breathing, and being fatigued among several other symptoms. Social anxiety disorder is a subcategory of anxiety disorders in which the individuals with the disorder have intense fear or anxiety about and in social situations or performances. The main theme behind the worries of those with social anxiety is that they will be negatively judged and ultimately embarrassed. This often leads to an avoidance of social situations and a lack of participation in conversation or discussions at school and at work, which often leads to maladaptive strategies such as self-isolation.

Although anxiety is a serious disorder for all age groups, individuals who have not yet reached adulthood are more vulnerable to the disorder and have a high-risk period for the onset of anxiety disorders (Kessler et al., 2012). In the last decade, anxiety has become one of the top presenting concerns among college students (59.2%; The Association for University and College Counseling Center Directors, 2012). Anxiety disorders are amongst the most prevalent health disorders in the United States with a diagnosed population of over 40 million. This accounts for 19.1% of the American population, and most with the disorder are diagnosed before the age of 21 (National Alliance on Mental Illness, 2017). The National Comorbidity Survey (2005) found

that an estimated 31.9% of young adults have an anxiety disorder with females more likely than males to present with the disorder.

One of the more common anxiety disorders amongst young people is that of social anxiety with a diagnosis rate of 90% occurring before the age of 23 (Kessler et al., 2005). The age of onset for social anxiety disorders is directly correlated with the independence associated with children becoming teenagers and moving into the realm of adulthood as people begin to take on more responsibilities. There is no longer a need for the parental reliance typically associated with childhood. Adolescents and emerging adults begin to interact with peer groups more often, not only relying on themselves more but also their peers during this time.

Young adulthood is a crucial period as this newfound reliance on peer groups shapes and develops many neurocognitive abilities. This developmental period creates more sociable individuals with the ability to build complex peer relationships and increased sensitivity to peer acceptance and rejection (Steinberg & Morris, 2001). When compared to adults, adolescents who are experiencing peer rejection reported more feelings of anxiety and negative mood in addition to lower feelings of belonging, which in turn often negatively affected their self-esteem (Sebastian et al., 2010). The study analyzed the role of social communication in gaming to understand how technology alters social interaction. Adolescents who experienced peer rejection online had lower mood levels, leading them to dwell on negative feedback, as well as exhibit maladaptive coping behaviors (Sebastian et al., 2013). Adults showed little sensitivity to rejection during the same simulation. This finding suggests that abilities continue to develop in the period between adolescence and adulthood.

Connections between anxiety, risk aversion, and reward sensitivity have been found. It is hypothesized that individuals with anxiety may be less reward motivated and more averse to

risks due to the fear of potential punishment as a result of risk taking (Dorfman et al., 2016).

However, individuals under social stress made more risky decisions (Lejuez et al, 2002). When

combined with high levels of social anxiety, participants exhibited more risk taking compared to

their low social anxiety peers. It should also be noted that studies assessing risk and anxiety are

difficult and complex to measure since clinical settings do not often yield the same results as

real-world situations. The age of onset for anxiety disorders makes them quite prevalent in young

adulthood; however, this prevalence can also be attributed to neurobiological changes taking

place during this time. At this stage in development, young people are experiencing rapid growth

in neural systems that not only can explain increases in anxiety, but also increases in risk taking

and reward sensitivity.

Brain Development in Young Adults

  Risk-taking and the Brain. The young adult brain has often been an area of study due to

the variety of developmental changes that accompany this period. Adolescents and young adults

are more susceptible than any other age group to engage in risky behavior (Steinberg, 2008). It

was initially believed that young adults engaged in more risky behavior simply because they

were not able to fully comprehend and evaluate risks as well as their adult counterparts. By the

time individuals reach adolescence, they are undergoing many new changes in the area of socio-

emotional development that are not complete until the mid-20s (Arain et al., 2013). The

maturation of the brain and neural systems is often mistaken for growth; however, this period is

better characterized as a reorganization of these systems as they adapt to become more efficient

and allow the brain to restructure into a more adult-like way of thinking. This belief has been

supported and studied through various neurobiological mechanisms and features of development.

One of the most well-known features of this time is the neuroplasticity of the brain and the adaptability it allows (Arain et al., 2013). However, the everchanging neuronal landscape occurring in adolescence and young adulthood can also create a certain level of vulnerability. The brain's cognitive control system, the prefrontal cortex, is one of the last regions to fully develop. This region has been associated with complex cognitive behavior, such as decision-making and social behaviors, making it responsible for self-regulation, planning, and rationality (Steinberg, 2015). The late development of the prefrontal cortex coupled with the early maturation of subcortical regions such as the limbic system, which is responsible for emotion generation, contribute to impulsive and risky behaviors as a result of the difference in development paths (Dahl, 2004). The developmental changes of these brain structures can be observed in Figure 1. Due to these differences, emotions likely cancel out cognitive control systems, leading to a lack of judgment, reasoning, and impulse control (Chambers et al., 2003). This information suggests an explanation for the high rates of risky behaviors among young adults mentioned previously that contribute to automobile accidents and experimenting with sex and drugs.

Young adulthood is also a period where emotional sensitivity is at a peak which affects the ability to think logically, making developing brains more sensitive to the opinions of others and often leading to sensation seeking, or the need for intense experiences (Cracco et al., 2017; Steinberg, 2015). The neurobiological development of emotion regulation shows how as people age, emotions have less of an effect on the decision-making process.

Further evidence for developmental changes as the two systems mature and move towards working in tandem to create an adult brain lies within the processes of pruning and myelination and the changes in white and gray matter volume (Giedd, 2008; Paus, 2005;

Steinberg, 2015). These processes work to further reorganize the brain by strengthening neural pathways. During adolescence, there is a continuous increase of white matter volume in the posterior corpus callosum which bridges communication between the right and left hemispheres of the brain leading to a more adultlike brain (Figure 2; Giedd, 2008). Adults can simultaneously use multiple areas of the brain from distant regions, whereas children tend to only have connections to nearby or neighboring brain regions. These connections continue to grow until the early twenties. Another noticeable difference in the development of the adolescent brain is that while the volume of white matter seems to increase, an inverse trend can be seen in gray matter volume in areas such as the prefrontal cortex. Interestingly, decreases in gray matter, within prefrontal regions of the brain, are also associated with high levels of internet usage (Kühn & Gallinat, 2015).

Both the increase and decrease of gray and white volume matter are believed to be a result of increased myelination and synaptic pruning (Paus, 2005). Synaptic pruning refers to the removal of synapses that are considered inefficient, meaning the synaptic connections are no longer in use. Myelination is the term to describe the process of an axon becoming covered with a fatty substance (myelin) that works to conduct electrical impulses in a much more efficient manner. This process works to not only help information move more quickly but it also helps it move longer distances, which strengthens executive function that encompasses processes such as problem-solving, planning, and decision making (Paus,2005; Steinberg, 2015). Another explanation for the influence of heightened emotional sensitivity in young adults stems from the knowledge that the frontal lobes (Figure 2), which are responsible for emotion regulation, reasoning, and problem-solving, are one of the last regions of the brain to experience myelination (Rubia et al., 2016).

The reorganization of the brain as it matures and progresses to more adultlike cognitive abilities also causes great vulnerability and makes developing adults more prone to taking risks due to poor inhibitory control and heightened impulsivity (Spear, 2000). Research has shown a strong relationship between the poor development of executive functions and substance use. Executive functions are higher- level cognitive abilities that are related to the regulation of goal directed behavior. The development of these functions, or lack thereof, have often been used as predictors for drug use influences such as peer affiliation and academic competence (Tarter et al., 2011). The connectivity between the prefrontal cortex and the limbic system has strengthened considerably by the late teens and early twenties, leading to more self-regulation and impulse control.

In addition, emotional sensitivity is no longer as heightened as it once was and does not disrupt rational thought processes as easily, leading to the ability to fully consider the consequences of decisions, thus leading to less risky behavior (Steinberg, 2015). This knowledge details how crucial the development of the emotion regulation system is in the decision-making process. This process connects risk to reward, as every decision is simply an analysis of risk and reward.

Reward Sensitivity and the Brain. Reward processing systems are among the many processes undergoing development in adolescence, during which the sensitivity to rewards is at its peak (Galvan, 2010). Although these changes begin in adolescence, they are not complete until early adulthood, leaving emerging adults susceptible to the effects of the developing reward systems. The prefrontal cortex is believed to have strong executive control over behavior making it central in the human reward system. In terms of research, rewarding behavior is often monitored and referred to as having greater motivation or incentive. The Nucleus Accumbens

(NAc) is located inside the ventral striatum and plays a key role in emotional and motivated

processing (Figure 2). Additionally, the NAc is heavily involved in the processing systems of

reward and pleasure, making it an area of focus in studies on reward motivation (Clithero et al.,

2011). The role of the NAc in reward processes has led to the belief that increased activation in

NAc circuitry is likely to be predictive of an increase in taking risks.

Not all studies analyzing the relationship between risk and reward have negative

implications. In a 2013 study, Teizer and colleagues found an increase of activation in the NAc

of individuals who chose rewards for their families rather than themselves, and this activation

served as a predictor of decreased risk taking at a one-year follow-up. However, there are some

current bodies of literature in which a relationship between reward sensitivity and risk-taking

was not found in both real-life and laboratory settings, as it is difficult to monitor real-life

scenarios (Galvan et al., 2007).

The involvement of the NAc in the areas of risk and reward also make it an area of

interest in the research on addiction. The developmental changes occurring in the NAc lead to an

increased risk for drug use in young adults due to the increase in sensitivity in reward areas of

the brain (Spear, 2000). This increase often outweighs self-control abilities that are not fully

developed, leading to addiction at a young age. This supports the incongruent development of

neural pathways and brain structures associated with development.

Reward centers of the brain have strong ties to the four main dopamine pathways within

the human brain, three of which play a key role in acting together as the reward pathway (Ayano,

2016). The pathways involved in reward processes are the mesocortical, mesolimbic, and

nigrostriatal. The nigrostriatal pathway has commonly been implicated in addiction research.

Dopamine, a neurotransmitter often associated with feelings of happiness, is responsible for how

the brain interprets and processes rewards. A significant increase in dopamine levels can be seen during adolescence; these levels decrease and stabilize during young adulthood (Anderson et al., 1997; Wahlstrom, 2011).

The relationship between dopamine and rewards becomes increasingly relevant in discussions of learning and motivation, as both systems involve the incentive of rewards to continue. The hub of dopamine activity takes place in the striatum, as well as regions such as the orbitofrontal cortex (Galvan, 2010). Individual differences in the production of dopamine in the ventral striatum and the ventromedial prefrontal cortex were correlated with individuals' willingness to spend more effort on larger rewards (Treadway et al., 2012). This means that individuals with decreased production of dopamine cared little for information regarding reward magnitude and the likelihood of receiving a reward. Dopamine has been implicated in the relationship between reward and motivation, in which low levels of dopamine production have been found to lead to a lack of motivation (Bromberg-Martin, 2010).

Previous literature has suggested a strong relationship between reward sensitivity and other variables such as sensation-seeking and impulsivity. Sensation seeking is a trait used to describe the tendency to actively seek complex, novel, and intense experiences. This trait has been linked to dopamine brain pathways, in which the increase of sensation seeking can be attributed to the increase of dopaminergic activity that occurs during adolescent neurodevelopment (Chambers et al., 2003; Spear, 2000). This information has been used to explain the relationship between young people and drug use. The desire to actively seek new and intense experiences often leads to experimentation with drugs. The novelty of a drug entices individuals to experiment with it long enough for the addicting effects of the drug itself to take over when the novelty is no longer present. Specific drugs such as nicotine, alcohol, and

marijuana have been found to contribute to the release of dopamine in the reward system, leading users to view the experience as rewarding (Dackis & O'Brien, 2005). These findings support and provide a neurobiological explanation for the increase and susceptibility to drug use at a fundamentally important developmental period.

Currently, two hypotheses address the growing research on reward systems in emerging adults. Research supporting both hypotheses seeks to evaluate the differences in how adults and developing adults experience pleasure. On one end of the spectrum, it is believed that adolescents and young adults are hyporesponsive to rewards, meaning that the threshold for reward sensitivity behavior is raised as they attempt to achieve a similar activation as their adult counterparts (Spear, 200). On the other end of the spectrum, it is hypothesized that a heightened sense for reward in young adults is a result of a hyperresponsive reward system, which also results in greater reward sensitivity (Chambers et al., 2003). However, while these two hypotheses exist, there is considerably less evidence in favor of the first. Studies suggest that when compared to children and older adults, younger adults have a higher sensitivity to rewards. Additionally, they also have a lowered ability to avoid negative behaviors in contexts where rewards are related (Steinberg et al., 2008).

Research supporting the hyperresponsive system views activation of the ventral striatum as the main measurement in determining how responsive people are to rewards. The ventral striatum not only houses the nucleus accumbens (Figure 2) but is also a key component in social behavior and reward processes. Increased ventral striatum activity in young adults has been found in monetary reward studies when compared to the ventral striatum activity of adults 27 years old on average (Ernst et al., 2005).

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Recent studies have also begun to examine the effect that hormones during puberty can play on reward activation. Forbes and colleagues (2011) found that higher levels of testosterone predicted increased activation of reward-related circuitry in the ventral striatum. This data indicated that significant differences in reward processes may be found between males and females. Gender differences are important to the examination of reward systems, due to hormonal and developmental differences. These differences can be found between males and females in key brain structures, such as the striatum. This structure develops at different rates between genders with a two-three year gap, which could affect the ability to process rewards in each gender until adulthood (Forbes et al., 2005).

Anxiety and the Brain. The onset of anxiety disorders is early, with the average age of onset affecting individuals as early as 15, making it much more prevalent in young adults than any other age group (Lijster et al., 2017). In studies of patients with anxiety disorders, a strong association with brain structures such as the hippocampus, amygdala, and the anterior insula has been found (Carlisi et al, 2017). Although this association has been found in a wide age group, an abnormal thalamic volume has also been found to serve as a predictor of social anxiety in childhood and young adulthood (Xie et al, 2020). In addition to the activation of these brain structures in anxiety-related processes, neural networks are also believed to be involved, which may explain the increase of certain mental illnesses during young adulthood.

Anxiety disorders in their simplest form have been described as the result of improper functioning of the fight or flight response of the sympathetic/parasympathetic nervous systems. This response was evolutionarily developed to allow humans to react quickly to life-threatening symptoms; however, the human body may also respond to non-life-threatening stressors causing anxiety. The activation of the sympathetic nervous system is the root behind somatic symptoms

in anxiety disorders, such as a quickened pace of heart beating, difficulty breathing, and sweating. There are a surprising number of neurobiological markers associated with anxiety disorders, and it is found that genetics may contribute to a portion (30-50%) of the development of an anxiety disorder (Reiss et al., 2013). Further evidence for a malfunctioning fight or flight response is the presence of fear in those with anxiety disorders that present as abnormalities in the ventral hippocampus, basolateral amygdala, and the medial prefrontal cortex. All of the brain structures previously listed are involved in fear learning and responses, and enhanced activation of these systems is found in patients with anxiety disorders (Williams, 2016).

Social anxiety disorder is a subset of anxiety disorders and shares many of the same symptoms. However, based on neurobiological data, there are also many differences between the two. Morphological evidence has been discovered that is associated with social anxiety disorder, as well as generalized anxiety disorder. Patients with social anxiety have been found to have larger volumes of gray matter in the dorsal striatum, reduced frontal lobe volume, and increased amygdala volume (Bas-Hoogendam et al., 2017). Conversely, those with generalized anxiety disorder have a decreased volume of both the ventromedial prefrontal cortex and the hypothalamus (Chen et al., 2020). Differences in connectivity between the prefrontal cortex and the amygdala can be seen with enhanced functioning between the two brain areas in those with social anxiety disorder but weaker functioning in those with generalized anxiety. This connectivity is very telling, as the amygdala is the structure responsible for detecting stress and threats from the environment, which includes both emotional and biological factors. The prefrontal cortex is then able to regulate emotional responses and act as a control center, which typically helps calm and regulate emotions once the danger or stressor has passed (Brooks & Stein, 2015).

The previous findings apply to groups of all ages; however, there are specific differences that can be seen in adolescence and young adulthood as the brain is undergoing reorganization throughout many of its connections. The prefrontal cortex, which has been shown to play a strong role in emotional responses, has a stronger activation in older adults than adolescents and young adults, leaving young people with less cognitive control in anxiety-inducing situations and causing them to be more likely to be affected by emotional interference (Hare et al., 2014). As the restructuring process of the brain is occurring, many of the brain's structures do not develop at equivalent rates. The delayed development of the connections between the amygdala and the prefrontal cortex leaves the brain vulnerable to emotional abnormalities. Delayed dendrite remodeling has been linked to a higher risk of developing anxiety disorders as this weaker signal has an impact on cognitive function (Koss, 2014). As previously described, young adults are more sensitive to reward due to the increase of activation in the ventral striatum. Some data suggest the connectivity between the ventral striatum and the prefrontal cortex declines with age. In fact, individuals with generalized anxiety show an increased connection between the striatum and the amygdala, leading to higher sensitivity to reward-related contexts (Liu et al., 2015).

Risk and Reward

Sensitivity to reward and risk-taking behavior are often closely associated (Burke et al., 2017; Slovic et al., 2002; Teizer et al., 2013). This is a well-established relationship that can be seen from the age-old adage "High risk, high reward," coined to mean that the potential of receiving a larger reward comes at the price of a great risk. Young adulthood is characterized by numerous developmental changes ultimately leading to self-discovery. This period is often characterized by how young adults begin to rely on their peers more than their family units and because of this, they are more susceptible to peer influence (Steinberg & Morris, 2001).

Additionally, because of the incongruent developmental pathways in the brain, young people are more likely to seek more intense experiences such as participating in risky behaviors. This reaction stems from the belief that the payoff will be more rewarding than the risk (Steinberg, 2015). This has also led to the development of a model known as the Dual Systems Model, which posits that an increase in taking risks is a result of the imbalance between developmental pathways. These pathways involve imbalance for both impulsivity and reward systems, in which there is a lack of impulse control accompanied by a high sensitivity to rewards (Sommerville et al., 2010; Steinberg, 2010).

As mentioned earlier, it has been found that young adults seem to find peer interactions more rewarding. The reward of peer interaction only increases risky activity among emerging adults as it is viewed as a more immediate reward rather than a long-term reward that does not seem as valuable (Albert et al., 2013). This information supports why young people are more susceptible to peer pressure than any other age group.

Indeed, individuals who anticipated positive outcomes as a result of risky behavior were more likely to follow through with that behavior (Galvan et al., 2007). When compared to adolescents and adults, children are often unable to evaluate outcomes of risky behavior, leading researchers to believe that rewards are either not a motivating factor for children to engage in risky behavior or that children have not yet fully developed their reward system. Adolescents and adults respond similarly to each other, further confirming that they have processing abilities differing from children.

Risk and reward systems have also become a large body of research in the area of addiction. One of the largest factors in evaluating a risk as less risky is the influence of peers and outside sources. Young adults, who are already highly influenced by peers, are at a higher risk

for developing addictions (Das et al., 2016). Behaviors that are seen as favorable and deemed less risky by peers, media, or personal experience can influence decisions more than other information describing the risk (Slovic et al., 2002). If people are continuously exposed to others who are not negatively associating any risks with the action, such as drug use, then people are more likely to perceive the risk as less risky. Individuals who smoke and receive pleasant and rewarding sensations are likely to attach less risk to the activity over time (Slovic et al, 2001). The longer individuals engage in risky behavior without any negative consequences, the more likely they are to continue, as they may no longer associate risk with the activity.

In addition to the growing body of research on risk and reward, it has been found that this relationship is also associated with character traits such as novelty and sensation seeking (Rao et al., 2011). There are many objects and situations associated with these character traits and the relationship between risk and reward, one of which is social media. Thus, the relationship between risky behaviors and social media has recently emerged as an area of study.

The Effect of Social Media

    Risky Behavior. There has been a significant relationship found between higher levels of social media use and more frequent risky behavior engagement (Vannucci et al., 2019). Existing research suggests that the ability to quantify popularity on social media through the use of likes and followers has led to an increase in risky behaviors in young adults. Emerging adults find social relationships more rewarding than any other age group, contributing to their motivation to seek peer acceptance (Steinberg & Morris, 2001). Social media has morphed into a tool to collect data on negative and positive feedback from peers, ultimately altering individuals' perceptions of themselves and leaving them to seek methods on how to maintain or increase their acceptance. Peer pressure that causes risky behavior is not limited to face-to-face situations, but also flows

into the online world. It increases exposure to risk-taking behaviors such as drug use, violence, and sexual content, in turn normalizing this content and behavior amongst younger age groups.

Young adults have been found more likely to share or like risky content if it has already been "liked" by peers. This teaches social media algorithms to create and show more content applicable to what teens are already liking and further increases the exposure (Sherman et al., 2016). This phenomenon is well known enough that the term Facebook Influence Model was created to demonstrate how positive portrayals of risky behavior, such as substance use, sexual activity, and violence become more socially desirable and normal. The normalization and familiarity of risky behaviors online affect young lives both online and offline, as they often conform to these behaviors to receive social reinforcement from peers in the hopes of creating a more known social identity (Moreno & Whitehill, 2014).

Although not all who use social media use it to increase their social acceptance, those who put a high amount of effort into the way they are presented online to obtain likes and followers fit the description for digital status-seeking. These individuals are more at risk for substance use and risky sexual behaviors (Nesi & Prinstein, 2015). These behaviors increase future risk through the capability of resulting in large consequences. Effects of these behaviors may carry into adulthood, such as addiction, sexually transmitted diseases, and unintended pregnancies at young ages.

All social media are not created equal, and presently Snapchat and Instagram seem to be the preferred media sites for young adults, as they allow and perpetuate status-seeking through likes, comments, and the use of filters to alter appearances to further promote appearance (Pew Research Center, 2021). Snapchat and Instagram both allow for stories to be posted for 24 hours, making it easy to document and display daily life, which may include images of them engaging

in risky behaviors. Another reason these sites may be so appealing is that they may lack an older

adult audience. This compares to sites such as Facebook, where individuals are often friends with

their parents. The lack of adults seems to be interpreted as a lack of consequences where young

people can document aspects of their lives that seem to be hidden from parents (Vannucci &

Ohannessian, 2019). This increased documentation of risky activities among individuals who see

the behavior as more rewarding when they associate the lack of consequences with a low risk of

getting caught. The online documentation of risky behavior further normalizes the content to

peers, who may also begin to see the behavior as less risky the more often they are exposed.

Reward Sensitivity. What people find rewarding seems to change across developmental

periods. This shift is important for the current and future generations of adolescents as new

avenues for communication and peer interaction are created, such as social media.

Social media is an addictive system in and of itself that has the ability to activate the

brain's reward system. It has been found that humans of all ages experience a rewarding

sensation upon self-disclosure on social media sites, simply because they crave social interaction

and love to talk about themselves (Tamir & Mitchell, 2012). Social media centers around the

sharing of lives and showcasing the best versions of people. People are estimated to talk about

themselves 80% of the time spent on social media, compared to the normal 30%-40% of the time

spent talking about themselves in the offline world (Dunbar et al., 1997; Naaman et al., 2010).

The release of pleasant feelings positively reinforces the brain to associate social media

with "rewards," such as likes and positive comments (Sherman et al., 2016). Social media often

provides the attention not typically experienced in day-to-day life. The accumulation of likes in

an online post provides a unique kind of recognition encouraging young adults to repeatedly

check for responses and additional likes to their content on social media. Young people are

encouraged to constantly check social media (perhaps out of fear of missing out) for any new notifications that may give a similar reward previously experienced with the posts.

Much literature on the area of social media compares those who are habitual users to those who gamble on slot machines. Both activities hold unpredictable outcomes, and at times rewards, that act as a psychological lure to engage participation. These rewards, as a variable reinforcement schedule, mean that the unpredictability is one of the main reasons why social media users feel the need to repeatedly check and refresh their social media feeds (Griffiths & Nuyens, 2017). Neither gamblers nor social media users know whether they will be met with rewarding information the next time they refresh the machine.

In addition to unpredictable outcomes, young adults seek social validation through social media with the use of positive feedback in the form of comments and likes in response to their posts. However, the exposure to negative feedback has the opposite effect of a reward and may induce anxiety along with other negative feelings. The knowledge of the power of likes and comments on social media influenced Instagram CEO, Adam Mosseri, to introduce a new concept in 2019. Mosseri announced that the company was in the process of testing and implementing the ability to remove the number of likes on photos people can see (Levanthal, 2019). Rather than users seeing a number of likes for an online post, they will see a single username followed by "and others" to display the number of likes on a post. This change was initiated to help spare feelings and negative emotions associated with comparison and reduce concerns of insecurity and poor mental health. Adolescents seem to find social media very rewarding when the content and feedback are in their favor; however, negative feedback seems to take a toll on mental health, leaving anxiety an important factor to consider (Sowislo & Orth, 2013).

Anxiety. Since the conception of social media, both strong and negative connections to mental health have been found. It is no new revelation of the role social media plays in the lives of young people, with 90% of young adults using social media, and a majority using two or more platforms daily (Perrin, 2015). Social media can bring those far away closer through a screen and can help people feel less alone in the world. Past and current research has associated increased risk for anxiety and depression in young adults with higher volumes of social media usage. This is in part due to the disconnect from reality that social media can cause by not having face-to-face social interaction and also in part due to the length of time spent on social media.

The longer one spends online, the more likely they are to experience negative interactions, as well as negative effects on their ability to maintain sustained attention (Firth et al., 2019). However, there have been recent studies suggesting that the volume of social media usage may not be as important or have as great of an effect compared to how one experiences social media. For instance, individuals that experience social media negatively, such as those that are the victims of cyberbullying, not only have decreased self-esteem but also decreased life satisfaction (Sowislo & Orth, 2013). This information indicates that the length of time spent on social media may not make a difference in terms of negative effects. However, if the content and feedback on social media are found to be negative, then that is a larger predictor of poor mental health than time spent online.

At this present time, research conducted on the relationship between anxiety and social media has had difficulty finding whether a causal relationship exists when determining if anxiety stems from social media usage or vice versa, as there are data that support both sides. A higher daily social media use in U.S. emerging adults was strongly associated with the likelihood of having an anxiety disorder (Vannucci et al., 2017). Additionally, social media users who used

seven or more social media platforms had higher self-reported symptoms of anxiety and depression when compared to users with fewer social media platforms (Primack et al., 2017). Although many studies have come to the same conclusion of a positive relationship between anxiety and social media, there have been several proposed ideas as to why this relationship might exist.

It is believed that social media itself can serve as a large source of stress, especially in adolescents and young adults, with the ability to cause anxiety-related impairment through the activation of the physiological stress response (Mauri et al., 2011). This stress can stem from negative feedback from peers, which includes negative comments via social media. These comments can cause emotional damage to users. The damage to users can be amplified by the embarrassment and humiliation felt with the knowledge that others may have read those harsh comments. In addition to negative peer feedback, social media can also induce anxiety in less obvious ways, such as through exposure to stressful events happening around us, whether through the lives of others or world events.

It is believed that many forms of social media may also cause communication and information overload with the rapid inflow of information that changes each time the social media page is opened or refreshed (Chen & Lee, 2013). Furthermore, receiving information from multiple social media platforms can result in multitasking issues that can lead to cognitive failure and lower the ability to respond to stressors that affect emotion regulation (Becker et al., 2013). The theme behind all social media sites is to provide connections; however, this has become a double-edged sword, as it also acts as an avenue to promote negative social comparisons and jealousy. Content on social media sites may lead people to believe that they are seeing images of

people who seem happier than they are, which can further cause anxiety-related symptoms (Chou & Edge, 2012).

Studies contradicting the hypothesis that social media usage predicts anxiety symptoms suggest that the inverse may be true. Instead, individuals who are anxious seem to use social media more than those without anxiety. Individuals with anxiety, specifically social anxiety, may prefer social media and even use it as a primary form of communication to avoid possible in-person social rejection (Valkenburg & Peter, 2009). Additionally, those with social anxiety may turn to social media to avoid fears of negative social evaluations that may have occurred during in-person interactions. Not only does online communication provide an opportunity to evade in-person social interaction, but it also provides individuals with the time and the ability to have more control over their dialogue, thus relieving these individuals of the quick response time typically expected in face-to-face interaction.

Individuals with anxiety may also use social media as a maladaptive coping strategy to seek reassurance on their self-worth through likes and comments (Clerkin et al., 2013). Additional maladaptive coping strategies include using social media as an escape from current problems and obsessively ruminating over online interactions. This behavior becomes increasingly problematic as users create a psychological dependency on social media as a way of coping with negative moods.

With the creation of social media, another social anxiety-inducing feature, termed FOMO (Fear of Missing Out), has been exacerbated through the ease of sharing stories, popular event details, and social gatherings. FOMO stems from not being invited or being unable to attend activities and being overwhelmed with pictures further detailing what was missed (Franchina et al., 2008). FOMO leads to anxious thoughts, such as the belief that individuals are not being

missed, being forgotten, and confused as to why they were not invited. These feelings existed before social media, however; without the power of social media, people may not have ever learned about situations that would have created these thoughts, owing power to the phrase "Ignorance is Bliss".

The research surrounding social media and mental health has continued to grow. With each new change of social media and each new generation, the need to conduct more research on the topic continues. Currently, individuals from all age groups seem to acknowledge the beneficial and harmful aspects of social media. The intent of social media was to provide connections. These connections offer the ability to foster and cultivate relationships. However, the detrimental aspects of social media allow for the development of maladaptive coping behaviors leading to the creation of unhealthy relationships with social media platforms.

Social media may have a greater effect on young adults than any other age group. The process of undergoing many neurodevelopmental changes has led to one of the most vulnerable populations to the effects of social media. Although it has been found that young adults spend more time on technology than any other age group, other research provides a clearer view as to why social media leaves a lasting effect. Emerging adults are undergoing numerous developmental changes that impair the ability to make and process decisions, as well as incongruent development of the emotion regulation system. Both socioemotional and neurobiological data describe the implications that social media has on the developing brain. With ever-changing variables, it is important to closely monitor and discover trends to help better understand the impact of social media to be proactive and mentally protect individuals to combat any potential negative effects.

Hypotheses

Hypothesis One

The purpose of the present study is to examine the effects of social media usage in the risk-taking, reward sensitivity, and anxiety systems of emerging adults. Previous literature suggested that the usage of social media in both time and purpose are related to risky decisions, anxiety disorders, and reward-seeking behavior in young adults (Vannucci et al., 2017; Vannucci et al., 2019). In this study, measures will be used to determine how often participants use social media and the purpose for which they use it by applying scales intended to assess user engagement of social media. Previous research has been inconclusive on the role of social media in the area of developing adults. However, it appears that social media usage may relate to adolescent development based on the trends that were found in the Youth Risk Behavior Surveillance System (CDC, 2020). The main goal of this study is to look at the effect of social media on the variables of anxiety, and risk and reward systems and how social media engagement can be used to predict those variables

H1a: Participants who report more frequent social media usage will also report higher levels of risk-taking

H1b: Participants who report more frequent social media usage will also report increased sensitivity to reward.

H1c: Participants who report more frequent social media usage will also report higher levels of anxiety.

Hypothesis Two

Literature has shown several strong predictors of social anxiety. However, it is hypothesized that social media usage will serve as the strongest predictor for social anxiety when compared to reward sensitivity, and risk-taking.

H2: Social media will be the strongest predictor of social anxiety in participants.

Hypothesis Three

Research has highlighted the relationship between young adults and their propensity for risk-taking and social media usage when compared to other age groups (Ilakkuvan et al., 2019; Steinberg, 2008). Specifically, emerging adults on the younger end of the spectrum (18-20- years old) are more likely to take risks as a result of neurodevelopment that is not complete until the mid-20s (Arain et al., 2013). Regarding gender, ongoing neurodevelopment also plays a role; brain structures often mature earlier in females (Giedd, 2012). Additionally, literature also shows a strong relationship between social media usage and the increased documentation of risky behaviors that lead to the normalization of such behaviors (Vannucci et al., 2019). The exposure and normalization of risky behaviors can affect young adults by associating the frequency of behaviors with less risk and leading to an increase in risky behavior.

H3a: Younger participants (18-20 years old) who report higher levels of social media usage will also report higher levels of risk-taking behavior than older participants.

H3b: Male participants who report higher levels of social media usage will also report higher levels of risk-taking behavior than females.

H3c: Younger male participants (18-20 years old) who report higher levels of social media usage will also report higher levels of risk-taking behavior than older male, younger female, and older female participants.

Hypothesis Four

It is hypothesized that the relationship between social anxiety and risk-taking behavior will be stronger among those with reduced sensitivity to reward. This finding is anticipated due to research that indicates anxiety is associated with a reduction in both risk-taking and reward

sensitivity (Dorfman et al., 2016). Additionally, there is literature in support of the relationship between reward sensitivity and risk taking (Steinberg, 2010).

H4: Participants who report a reduced sensitivity to reward compared to those with a higher sensitivity to reward will demonstrate a stronger relationship between social anxiety and risk-taking behavior.

Methods

Participants

Participants (*N*=116) were recruited for this study via Amazon's data collection site - Amazon Mechanical Turk (MTurk). The sample consisted of more males (64.7%) than females (35.3%). Additionally, a large majority of the sample identified as Caucasian (69.8%). Equal proportions of respondents (7.8%) indicated that they identified as African American, Asian/ Pacific Islander, or Hispanic. The remaining respondents identified as Native American/Alaskan Native (6.0%) or Multiracial (.9%). Age ranged from a minimum of 18 to a maximum of 24 years of age (*M*=23, SD=1.66), to avoid sampling from protected populations. All APA ethical guidelines and IRB procedures were followed throughout the study (Appendix A).

Procedures

Participants had the option to participate in the survey by accepting or declining the opportunity through their MTurk account. The use of MTurk allowed participants to remain anonymous as no identifiers were associated with the data both directly and indirectly. Meaning no participant could be identified from an account number or IP address. Participants chose to volunteer for this study after being given research information (Appendix B). Participants began the study by taking a demographic questionnaire followed by a variety of scales that were

adapted and utilized to assess risk-taking, reward sensitivity, social anxiety, and social media usage (in this order).

Participants were asked to answer the questions provided in a survey format. Once participants completed all phases of the study, they were given a debriefing statement that contained the full intent of the study and were provided contact info of the lead researcher and the department (Appendix C). At that time, participants had the opportunity to print out the debriefing form or exit the survey. Once the study was completed, the participants were then compensated for their help with data collection.

Measures

Demographic Questionnaire. Participants were asked to complete a demographic questionnaire to analyze basic demographic information (Appendix D). This information consisted of responses over biological sex, age, race, and ethnicity. This questionnaire also asked participants to identify their number of active social media accounts, number of times checking social media accounts per day, time spent on social media (in years and months), time of day spent most on social media, and the duration (in years and months) of active social media accounts. Questions on social media use were adapted from the Social Networking Sites Usage and Needs Scale (SNSUN; Ali et al., 2019)

Reward Sensitivity Measure. The Behavioral Inhibition System (BIS)/ Behavioral Activation System (BAS) measured individual differences in motivation (Carver & White, 1994). The BAS is composed of three subscales measuring: drive, fun-seeking, and reward responsiveness (Appendix E). This scale had 20 items rated on a 4-point Likert scale where 1 indicated the highest form of agreement (Strongly Agree) and 4 indicated the highest form of disagreement (Strongly Disagree). Items were summed across each domain to determine a scale score with

lower scores representing higher levels of reward sensitivity. The psychometric properties of this scale indicated good reliability and validity with the internal consistency of all four subscales ranging from .66 to .76 (Carver & White, 1994). It was determined that items used to assess Behavioral Inhibition System (BIS)/ Behavioral Activation System (BAS) possessed a strong reliability for this study ($\alpha = .84$).

Social Anxiety Measure. The Social Interaction Anxiety Scale (SIAS) was developed to measure social anxiety across various situations (Mattick & Clarke, 1998) This measure contained 20 items (Appendix F). Participants responded to statements on a 5-point Likert scale where 0 indicated the highest form of disagreement and 4 indicated the highest form of agreement. The scores were then averaged to determine a scale score. Higher scores indicated higher levels of social anxiety (Peters, 2000). This scale was also found to be significantly correlated with the Social Phobia and Anxiety Inventory (SPAI). In regard to internal consistency, Cronbach's alpha is relatively high with a score of .93 (Peters, 2000). Cronbach's alpha for this study and sample size was found to be relatively high as well with a score of .93.

Social Media Use Measure. The Social Networking Sites Usage and Needs Scale (SNSUN; Ali et al., 2019) was developed to reflect the purpose and use for which individuals use social media (Appendix G). The scale consisted of 20 items, further categorized into five subscales that measure: Diversion, Cognitive Needs, Affective Needs, Personal Integrative Needs, and Social Integrative Needs. Participants responded to statements using a 5-point Likert scale where 1 indicated the highest form of agreement (Strongly agree) and 5 indicated the highest form of disagreement (Strongly disagree). Items were averaged across domains to determine scale scores in which high scores represent higher use of social media. In terms of psychometric properties, a composite reliability between .810 and .882 was found (Ali et al.,

2019). Cronbach's alpha for this study and sample size was found to be relatively high with a score of .89.

Social Anxiety on Social Media Measure. The Social Anxiety Scale for Social Media Users (SAS-SMU) was developed as a self-report measure to address social anxiety across social media platforms (Appendix H; Alkis et al., 2017). The scale was composed of 21 items that measured how often individuals experience anxiety in varying online situations through a 5-point Likert-scale where 1 indicated never and 5 indicated always. Additionally, the scale had four dimensions which consisted of shared content anxiety, privacy concern anxiety, interaction anxiety, and self-evaluation anxiety. High scores across all four subscales indicated social anxiety on social media. The internal consistency of each subscale was measured by Cronbach's alpha and was relatively high, ranging from .80 (self-evaluation anxiety) to .92 (shared content anxiety). Alpha coefficients for the remaining subscales also indicated high internal consistency with internal anxiety at .80 and privacy concern anxiety at .84 (Alkis et al., 2017). Cronbach's alpha for this study and sample size was found to be relatively high with a score of .94 for the combined scale.

Risk-Taking Measure. The Domain-Specific Risk-Taking (DOSPERT) scale was developed as a measure to assess risk perception among varying ages, cultures, and educational levels (Appendix I; Blais & Weber, 2006). This scale consisted of 30 items across five domains: ethical, financial, health/safety, recreational, and social. All domains were assessed according to participants' likelihood to engage in the listed behavior using a 5-point Likert-scale where 1 corresponded to extremely unlikely and 5 corresponded to extremely likely. Items were averaged to determine a scale score. High scores indicated increased risk for risk-taking behavior. In regard to internal consistency, Cronbach's alpha ranged from .74 to .83 for all subscales (Blais &

Weber,2006). Reliability for this study and sample size was found to be relatively high with a score of .93 overall.

Results

Data collection yielded 192 responses. However, 76 of these responses were removed due to incompletion or because the participants responded with an age outside of the target age group. The data were screened using the explore function of SPSS. The researchers first assessed for missing data. Five scores for the reward sensitivity measure were found to be missing at random, and as such, the average scores for each variable were inserted in place of the missing data. Three scores for the social anxiety measure were found to be missing at random and the average scores for each variable were also inserted. Nine scores for the social media use measure were found to be missing where the average score for each variable was inserted. Eight scores from the social anxiety on social media measure were found to be missing and the average score for each missing variable was inserted. Ten scores for the risk-taking measure were found to be missing and the average scores for each missing variable were inserted.

Continuous items in the demographic questionnaire that related to social media related to time use were adjusted to decimals. For example, when asked how long (in hours and minutes) was spent on social media each day, a participant's response of 3 hours and 40 minutes was converted to 3.67. All items on the BAS/BIS scale were reverse coded; however, items 10 and 12 were not subject to reverse coding.

Examination of histograms indicated that the distribution shapes for all variables were normally distributed; however, skewness and kurtosis scores were used as an additional measure to assess the distribution. The skewness and kurtosis were slightly outside the acceptable range of -1 to 1 for several variables in the Behavioral Inhibition System (BIS)/ Behavioral Activation

System (BAS), Social Interaction Anxiety Scale (SIAS), Social Networking Sites Usage and Needs Scale (SNSUN), and the Domain Specific Risk Taking (DOSPERT) scales. To further examine this distribution, the standard error for both skewness and kurtosis was multiplied by three then compared this value to the original skewness and kurtosis value. The standard error score when multiplying by three was larger than the original skewness/kurtosis score, thus it was concluded that all variables were normally distributed.

Correlation

A bivariate correlation was performed to test the hypothesis that social media usage and risk-taking are positively related. Results indicated that the correlation is statistically significant, $r(114)=.19$, $p < .05$. This finding supports the hypothesis in which increased use of social media was related to higher levels of risk-taking

An additional bivariate correlation was performed to test the hypothesis that social media usage and sensitivity to reward were positively related. Results indicated that the correlation is not statistically significant, $r(114)=-.112$, $p > .05$. This finding, while not statistically significant, displays a negative relationship between social media usage and reward sensitivity

A third correlation was performed to test the hypothesis that social media usage and levels of anxiety were positively related. Anxiety levels were assessed by combining scales that measured social anxiety on social media and anxiety offline. Results indicated that the correlation is statistically significant, $r(114)=.20$, $p < .05$. This finding supports the hypothesis that higher levels of social media usage were related to higher levels of anxiety.

To further probe the relationship between social media usage and levels of anxiety, two additional correlations were performed to individually assess the two types of social anxiety. Results indicated that the correlation between social media usage and social anxiety offline is

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statistically significant, $r(114)=.21, p < .05$. This finding continues to support the hypothesis. Increased usage of social media is related to social anxiety offline. However, the results indicated that the correlation between social media usage and social anxiety on social media are not statistically significant, $r(114)=.17, p>.05$. This finding displays that increased social media usage is not associated with social anxiety while on social media.

Hierarchical Regression

It was hypothesized that social media use would serve as the strongest predictor of social anxiety in participants. The data were screened to test the assumptions of a multiple regression including the assumption of multicollinearity. Results suggest that all assumptions were met; collinearity diagnostics for tolerance and VIF indicated that multicollinearity was not an issue when assessing the predictor variables.

To determine if age should be included in regression analyses, an independent t-test was performed to assess whether reported levels of anxiety differed significantly between age groups (18–20-year-olds and 21-24). The assumption of homogeneity of variance was assessed by Levene's test for age group, $F = .85, p >.05$. This indicated no significant violation of the equal variance assumption; therefore, the equal variances assumed version of the t-test was used. Reported anxiety levels did not differ significantly between the age groups, $t(114) = 1.62, p < .001$. Mean levels of anxiety for the younger age group ($M = 3.5, SD = .61$) were not significantly higher than mean levels of anxiety for the older age group ($M = 3.18, SD = .78$). Thus, age was not inputted into the hierarchical regression model.

A four-stage hierarchical regression was conducted with social anxiety as the dependent variable. Gender was effect coded and entered as a dichotomous variable at stage one. Sensitivity to reward was entered at stage two, risk-taking at stage three, and time spent on social media at

stage four. The variables were entered in this order based on the strength of the variables'

relationship to social anxiety from correlations conducted to test hypothesis one. Regression

statistics for the multiple regression variables can be found in Table 1.

The hierarchical multiple regression revealed that at Stage one, gender did not

contribute significantly to the regression model, $[F(1,114) = .02, p > .001, R = .01,$ Adjusted $R^2 =$

-.01]. Introducing the variable of reward sensitivity did not contribute significantly to the

regression model $[F(2,113) = 1.96, p > .001, R = .18,$ Adjusted $R^2 = .03]$. Adding risk-taking to

the regression model accounted for 48.8% of the variation in social anxiety and this addition was

significant $[F(3,112) = 37.48, p < .001, R = .71,$ Adjusted $R^2 = .47]$. Finally, the addition of time

spent on social media explained an additional 1% of the variance in social anxiety and this

change in R^2 was not significant $[F(4,111) = 28.87, p > .001, R = .71,$ Adjusted $R^2 = .01]$. This

finding does not support the hypothesis that time spent on social media would be the strongest

predictor. The data show that risk-taking is one of the strongest predictors of social anxiety,

which uniquely explains 68% of the variation in social anxiety. Together the five variables

accounted for 49.2% of the variance in social anxiety.

Factorial ANOVA

Hypothesis three was tested using a between subjects 2x2x2 factorial ANOVA. Three

independent variables, social media usage (high and low); gender (male and female), Age

(younger and older) were tested to assess for differences in risk-taking behavior. Age was

separated into two groups: 18-20 year olds and 21-24. This was accomplished by creating

categorical variables for the two age groups and re-coding the scale variable of age based on the

pre-defined age groups. The means and standard deviation for the variables of age and gender

can be seen in Table 2.

Results indicate no significant main effects of social media usage [$F(1, 108)= .11$, $p=.30$, partial $\eta^2 =.010$], gender [$F(1, 108)=.56$, $p=.46$, partial $\eta^2 =.005$], and age [$F(1, 108)=.76$, $p=.39$, partial $\eta^2 =.007$]. These main effects were not qualified by significant interactions between gender and age [$F(1, 108)=2.16$, $p=.14$, partial $\eta^2 =.02$], gender and social media usage [$F(1, 108)=.50$, $p=.49$, partial $\eta^2 =.005$], and age and social media usage [$F(1, 108)= 96$, $p=.33$, partial $\eta^2 =.009$]. Additionally, there was not a significant 3-way interaction [$F(1, 108)=2.00$, $p=.16$, partial $\eta^2 =.018$].

Moderation

A moderation analysis was performed to assess the prediction of risk-taking (Y) from social anxiety online and offline (X1) and sensitivity to reward (Z; moderator). It was hypothesized that social anxiety would predict the likelihood to engage in risk taking behavior when sensitivity to reward is low. To reduce any possible issues of multicollinearity, social anxiety and reward sensitivity were standardized, and an interaction term using these standardized variables was created. A hierarchical regression was performed to evaluate whether the interaction of social anxiety and reward sensitivity was predictive of risk-taking behaviors. Social anxiety and sensitivity to reward were entered in the first stage of the model and the interaction term was entered in stage two of the model.

Overall, the regression model was significant [$F (3,112)=35.30$, $p <.001$, $R=.69$; Adjusted $R^2=.47$]. Predicted risk behavior is equal to .486(Anxiety) + .063(Reward) + 3.363. It was found that social anxiety, combined online and offline, [$t(111)=10.21$, $p<.001$, $\beta=.486$] significantly predicted risky behavior while reward sensitivity was not statistically significant ($t(113)=1.3$, $p>.001$, $\beta=.063$).Together social anxiety and reward sensitivity accounted for approximately 47% of the variance in risk-taking behaviors. The interaction of reward sensitivity and social

anxiety was not significant indicating that moderation did not occur [$t(112)$=-1.12, p=.27; β=-.09].

A second moderation analysis was performed to assess the prediction of risk-taking (Y) from social anxiety offline (X1) and sensitivity to reward (Z; moderator). It was hypothesized that social anxiety would predict likelihood to engage in risk taking behavior when sensitivity to reward is low. To reduce any possible issues of multicollinearity, social anxiety and reward sensitivity were standardized, and an interaction term using these standardized variables was created. A hierarchical regression was performed to evaluate whether the interaction of social anxiety and reward sensitivity was predictive of risk-taking behaviors. Social anxiety and sensitivity to reward were entered in the first stage of the model and the interaction term was entered in stage two of the model.

Overall, the regression model was significant [$F(3,112)$=47.37, p<.001, R=.75; Adjusted R^2=.55]. Predicted risk behavior is equal to .528(Social Anxiety offline) + .093(Reward) + 3.363. It was found that social anxiety offline [$t(113$ =11.88, p<.001, β=.53] and reward sensitivity [$t(113)$=2.18, p=.03, β=.09) significantly predicted risky behavior. Together social anxiety offline and reward sensitivity accounted for approximately 55% of the variance in risk taking behaviors. The interaction of reward sensitivity and social anxiety was not significant indicating that moderation did not occur [$t(112)$=-.95, p=.34; β=-.07].

Lastly, a third moderation analysis was performed to assess the prediction of risk-taking (Y) from social anxiety on social media (X1) and sensitivity to reward (Z; moderator). It was hypothesized that social anxiety would predict an individual's likelihood to engage in risk taking behavior when sensitivity to reward is low. To reduce any possible issues of multicollinearity, social anxiety and reward sensitivity were standardized, and an interaction term using these

standardized variables was created. A hierarchical regression was performed to evaluate whether the interaction of social anxiety and reward sensitivity was predictive of risk-taking behaviors. Social anxiety and sensitivity to reward were entered in the first stage of the model and the interaction term was entered in stage two of the model.

Overall, the regression model was significant [$F(3,112)=20.11$, $p<.001$, $R=.59$; Adjusted $R^2=.33$]. Predicted risk behavior is equal to .40(Social Anxiety online) + .02(Reward) + 3.363. It was found that social anxiety online [$t(113)=7.6$, $p<.001$, $\beta=.40$] significantly predicted risky behavior although reward sensitivity was not significant [$t(113)=.42$, $p=.67$, $\beta=.02$). Together social anxiety offline and reward sensitivity accounted for approximately 33% of the variance in risk taking behaviors. The interaction of reward sensitivity and social anxiety was not significant indicating that moderation did not occur [$t(112)=-1.38$, $p=.17$; $\beta=-.13$].

Discussion

The findings from the study indicate that there is a relationship between the time spent using social media and reward sensitivity and risk-taking behaviors. The correlations provided evidence in favor of previous literature that suggest an increased period of social media usage provides the user with more opportunities to be exposed to content that may increase risky behavior (Vannucci et al., 2019). Additionally, literature suggests that the more time spent online, provides social media users with a higher probability of experiencing rewarding content, where the rewarding content incentivizes the continued and prolonged use of social media (Griffiths & Nuyens, 2017; Sherman et al., 2016).

When assessing the relationship between time spent using social media and social anxiety offline, a significant relationship was found, whereas no significant relationship was found between social anxiety on social media or a combination of the two types of social

anxiety. The relationship found between social media and social anxiety offline aligns with similar findings of Valkenburg & Peter (2009) who found a positive relationship between social media usage and individuals with anxiety. However, the lack of a significant relationship between social media usage and social anxiety for social media users is atypical to that of previous research. Past literature found that social media may include social anxiety inducing features relating to the content that users like or post when they are worried how others may judge them as a result (Becker, 2013; Chou & Edge, 2012). Although the correlations did provide statistically significant evidence, the relationships found were weak. This suggests that the specific variables being analyzed do have an impact, however, it also suggests the presence of additional determinants not analyzed within this study.

Although there was no relationship found between social media usage and social anxiety. The findings from this study revealed a significant relationship between social anxiety and risk-taking behavior, in that risk-taking served as a strong predictor for social anxiety. Additionally, the regression shows that there are additional variables that may account for additional variance in predicting social anxiety. However, sensitivity to reward was not found to be a variable that may account for additional variance or act as a mediator.

An additional variable that may be beneficial to measure in future studies is sensation seeking. This variable has been closely associated with the propensity to take risks (Pizam et al., 2004). It is defined as a character trait in which the individual actively "seeks" intense and novel experiences that will provide them with feelings of thrill. These feelings often accompany risks that the individuals are willing to take to experience thrilling sensations. This variable accompanied with individuals' engagement in risky activity may more accurately predict social anxiety.

There were no significant main effects found in support that younger participants with higher levels of social media usage would report higher levels of risk-taking behavior than older participants. The findings did not also support that males with higher volumes of social media usage reported higher levels of risk-taking behavior than females. Additionally, younger male participants with higher volumes of social media usage did not report more risk-taking behavior than older male, younger female, and older female participants. This is a contrast from previous findings that support individuals with increased social media usage or are male or younger tend to have increased propensity for taking risks (Ilakkuvan et al., 2019; Steinberg, 2008). As discussed in the limitations section this may be due to the risk-taking scale used. Participants may have had difficulty evaluating the likelihood of engaging in risk for some of the items as they may not have perceived them to be applicable to life in this time period and be unable to accurately respond.

The findings in this study were also surprising given that a wide variety of literature in the area of risk-taking found that males are more likely than females to take risks. Research has found that this is often a result of later brain development as the brains of females mature earlier and finish development earlier than males (Giedd, 2012). This late development affects brain structures involved in the decision-making process. Without brain imaging techniques, it is difficult to determine the brain maturation of individuals involved within this study. It is assumed that individuals at early maturation stages are more likely to indicate a higher likelihood of engaging in risky behavior. The lack of significant differences may be a result that the men involved in the study are less prone to taking risks regardless of brain development but possibly as a result of various other factors or personality traits. Similarly, the women involved in this

study may have responded with a higher likelihood of taking risks than the average woman observed in studies with gender differences in risk-taking.

Moreover, the lack of significant findings between differing age groups is also a contrast to past research. Previous literature has shown numerous findings of the difference in risk-taking amongst younger individuals. The similarities between the age groups may be an effect of the narrow age groups used. The two groups (18-20 year olds, 21-24 year olds) are very close in age. However, prior research has found that individuals in the younger half are more likely to take risks than any other group (Steinberg, 2008). This finding is partly due to the brain development of individuals in this age group and also a result of legal age qualifications to legally purchase products that can lead to risk such as alcohol, tobacco, etc. These age qualifications often begin at the age of 21 for most states in the United States. These products are most likely to be seen as riskier for younger individuals who do not have the ease of access and must explore riskier options to obtain the products. Additionally, younger age groups may have a stronger desire for these products due to the fact they are not easily available to the age group and may also provide social gratification. Hence, the separation of categories between the two age groups. The differences may not be noticeable between groups this close in age. Thus, future research may benefit from comparing both age groups to older age groups to truly find distinct differences.

Additionally, this study did not find that high or low levels of reward sensitivity could act as a moderator and accurately predict likelihood to engage in risk-taking behavior when levels of anxiety served as a predictor. This contrasts previous research that found that anxiety can be associated with a reduction in both sensitivity to reward and the likelihood to take risks (Dorfman et al., 2016). The lack of a significant finding may be a result that research in the area

of risk and reward for emerging adults focuses largely on the knowledge that this age group finds

social interaction more rewarding, leading to emerging adults taking more risks when there is a

social reward. Scales measuring reward do not seem to focus on specific subsets of rewarding

content such as social, financial, etc. but rather reward sensitivity as a broad category. This may

have led to individuals responding with a lower level of reward sensitivity that may not

accurately depict their sensitivity to reward in a social context.

Limitations

When examining the influence of social media usage, age, and gender on the effects of

risk-taking behavior, there were no significant interaction or main effects found. This finding

could be the result of the sample size collected. The sample population included a larger majority

of male respondents, as well as more individuals who responded as belonging to the older end of

the age spectrum. The unequal sample sizes between levels of each variable could have led to a

loss of statistical power. In addition, the presence of unequal groups could also lead to

confounding variables having an effect on the data. It was not possible to remove participants

and attempt to equate the group sizes to each other to maintain the sample size needed for the

study.

The methodological element of recruiting participants could also serve as another

limitation for the study. The survey was completed online by obtaining participants from the data

collection site Amazon Mechanical Turk. However, these participants obtain a small fee through

completion of surveys. This may have resulted in participants not reading the survey questions in

their entirety to quickly complete and receive payment. It may be beneficial for future studies to

complete the study using a face-to-face method or by having a computer lab in which the

participants can have access to complete the survey. Conducting the survey via a non-online

method may also allow the opportunity to survey individuals who prefer to minimize their time on electronics and thus also spend less or no time on social media.

This study utilized the Domain Specific Risk-Taking Scale (DOSPERT) to assess individuals' likelihood to engage in risky behavior. The DOSPERT is a reliable and valid scale to assess for the likelihood of risk-taking and covers several domains (Blais & Weber, 2006). However, some scale items may be difficult for the emerging adult age group to accurately assess as these items may not be entirely applicable to life at this stage such as "Investing 10% of your annual income on a new business venture". It is highly likely that a majority of the individuals in this age group have not yet started a full-time career, meaning that their annual income often refers to a part-time position. Therefore, investing 10% of an annual income for a part-time position may be perceived as less risky when compared to the same percentage for a full-time position. Several other scale items may also be difficult to apply to the lives of this age group, yet a vast majority of scales designed to assess risk-taking, are created for adults or children. Future research in the area of risk-taking may find it beneficial to create an assessment that can more accurately depict risky decisions and behaviors for the emerging and young adult population.

The findings of this study relied entirely on self-reported measures obtained by the participants. It is possible that participants did not answer truthfully or may have difficulty gauging the appropriate response for some of the scale items. Social media use is also a difficult construct to measure through self-reported questions. It is likely that a participant will estimate their social media use as most individuals do not keep strict track of the time spent on social media or when they opened their first social media account. This can lead to an over- or under-estimate of time really spent on social media or even a change in response if the participant

became embarrassed of their original answer. It may prove helpful to include a specific definition of the term "social media" as well as ask participants if the use of social media is within their job description. The latter qualification may be helpful to assess if some of the outliers who reported higher volumes of usage, use social media within their jobs such as a social media marketer.

Regardless of these limitations, the results from this study can still contribute to the field of emerging adulthood. It may lead researchers to continue exploring how social media may impact emerging adults. Additionally, future research can continue to explore the relationship between social media usage and the behaviors of risk, reward sensitivity, and anxiety to examine additional influencing factors.

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Table 1

Summary of Hierarchical Regression Analysis for Variables predicting Social Anxiety

| Variable	β	t	sr²	R	R²	ΔR²
Stage 1				.01	-.01	.000
Gender	**.019**	**.13**	**.12**			
Stage 2				.18	.02	.03
Gender	.060	.405	.04			
Reward	-.314	-1.97	-.18			
Stage 3				.71	.49	.47
Gender	.111	1.03	.07			
Reward	-.281	-2.48	-.16*			
Risk	.760	10.24	.68***			
Stage 4				.71	.49	.01
Gender	.135	1.25	.08			
Reward	-.294	-.173	-.17**			
Risk	.751	10.12	.67***			
Time Spent	.034	1.42	.10			

Note: N = 116; *p < .05, **p < .01, ***p< .001

Table 2

Mean Age and Standard Deviation of Participants by Age and Gender

| Age Groups by Gender	*N*	*M*	*SD*
18 - 20 Male	8	19	1
21 - 24 Male	67	23.33	.92
18 - 20 Female	5	18.8	.98
21- 24 Female	36	23.19	.84

Figure 1

Structural Changes over Adolescence and Young Adulthood
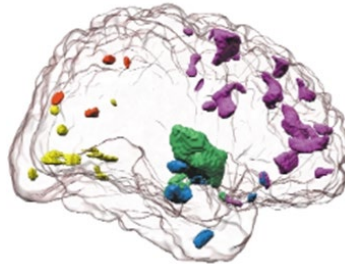
 Note: Figure shows the greatest changes that occur over adolescence and young adulthood. The regions shown in color are as follows: Subcortical region (e.g nucleus accumbens; green), prefrontal cortex (purple), parietal (red), and temporal lobes(blue). Adapted from "In Vivo Evidence for post-adolescent brain maturation in frontal and striatal regions", by Sowell, E.R. Thompson, P.M., Holmes, C.J., Jernigan, T.L., & Toga, A. W, 1999, Nature Neuroscience, 2(10), 859-861 (https://doi.org/10.1038/13154). Copyright 1999 by Nature America Inc.

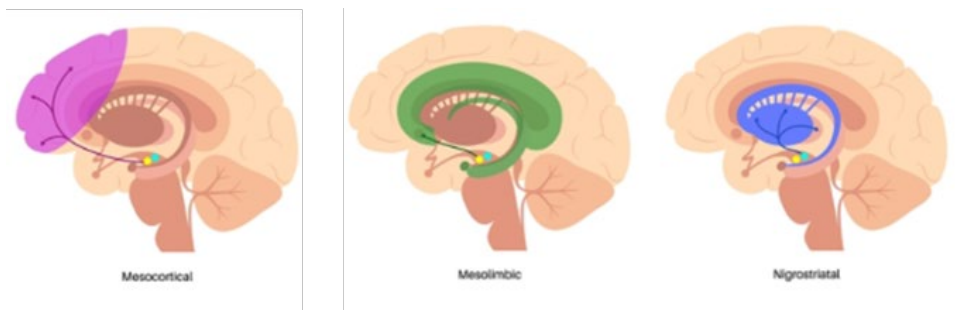**Figure 2**

Limbic System Brain Structures
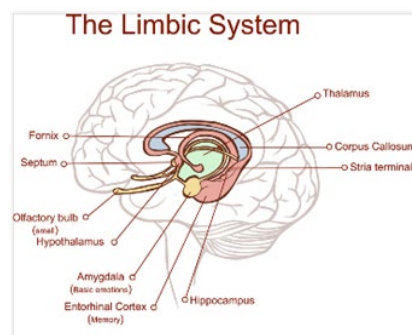
Note: Cross section of the human brain listing structures that make up the limbic system.

Figure 3

Dopamine Pathways

Note: Location of the three dopamine pathways implicated in reward processes.

Appendix A - Letter of Approval from the Institutional Review Board (IRB)

FORT HAYS STATE UNIVERSITY

Forward thinking. World ready.

OFFICE OF SCHOLARSHIP AND SPONSORED PROJECTS

DATE: February 22, 2022

TO: Victoria Medrano, BS
FROM: Fort Hays State University IRB

STUDY TITLE: [1867039-1] The Effect of Social Media on Anxiety, Reward Sensitivity, and
                         Risk-Taking Behavior in Emerging Adulthood
IRB REFERENCE #:   22_0087
SUBMISSION TYPE: New Project

ACTION: DETERMINATION OF EXEMPT STATUS
DECISION DATE: February 22, 2022

REVIEW CATEGORY: Exemption category # 2

Thank you for your submission of New Project materials for this research study. The departmental human subjects research committee and/or the Fort Hays State University IRB/IRB Administrator has determined that this project is EXEMPT FROM IRB REVIEW according to federal regulations.

For any research that will be conducted face-to-face, the FHSU IRB strongly recommends that the PI and research team adhere to CDC guidelines regarding COVID-19. Please note that neither FHSU nor the FHSU IRB are responsible in the event that a participant and/or member of the research team is exposed to risks related to COVID-19.

Please note that any changes to this study may result in a change in exempt status. Any changes must be submitted to the IRB for review prior to implementation. In the event of a change, please follow the Instructions for Revisions at http://www.fhsu.edu/academic/gradschl/irb/.

The IRB administrator should be notified of adverse events or circumstances that meet the definition of unanticipated problems involving risks to subjects. See http://www.hhs.gov/ohrp/policy/AdvEvntGuid.htm.

We will put a copy of this correspondence on file in our office. Exempt studies are not subject to continuing review.

If you have any questions, please contact Whitney Whitaker at IRB@fhsu.edu. Please include your project title and reference number in all correspondence with this committee.

- 1 -

Generated on IRBNet

Appendix B - Participant Consent Form

<u>Consent to Participate in Research</u>

Name of Study: The Effect of Social Media on Anxiety, Reward Sensitivity, and Risk-Taking Behaviors on Developing Brains

You are being asked to participate in a research study. It is your choice whether or not to participate.

PURPOSE OF THE STUDY
The purpose of the current study is to examine young adults between the ages of 18 and 24 and how behaviors such as anxiety, risk-taking, and reward sensitivity may be affected by social media. In regard to social media, this study will look at both how often young adults use social media and the purposes for which they use social media.

PARTICIPATION
If you choose to participate in this study, you will answer survey questions that will include questions about yourself and your social media habits as well as questions designed to measure your behaviors regarding anxiety, risk-taking, and reward sensitivity. The length of time of your participation in this study is 25 minutes. A minimum of 107 participants will be in this study. You may choose to end your participation in this study at any time without risk of penalty. Your decision to end your participation will not affect your job status with Amazon Mechanical Turk.

RISKS
It is unlikely that participation in this project will result in harm to participants, thus there is minimal risk associated with this research project. The study will be conducted anonymously in an online survey format. You may experience psychological distress as a result of reading survey items (i.e., anxiety and perceived risk) however, this distress shall not be greater than distress experienced in daily life. The anonymous and online format of the survey does not allow the opportunity to follow up with you in regard to your level of stress following the survey. Contact information for the faculty sponsor and the National Alliance of Mental Illness will be provided at the end of the study.

BENEFITS
You may gain insight into your personal experiences and behaviors. The field of psychology could also benefit from your participation in this study by gaining a deeper understanding of how social media and the development of the brain may influence the behaviors of young adults.

PAYMENT TO PARTICIPANTS
You will receive $0.25 upon completion of the survey. The monetary compensation will be placed into your Amazon Mechanical Turk account upon completion of the survey.

PARTICIPANT CONFIDENTIALITY (HOW WILL PRIVACY BE PROTECTED)
Your name will not be associated in any publication or presentation with the information collected about you or with the research findings from this study. Instead, the researcher(s) will

use a study number or a pseudonym rather than your name. Your identifiable information will not be shared unless (a) it is required by law or university policy, or (b) you give written permission.

Permission granted on this date to use and disclose your information remains in effect for the next five years. After a period of five years, the data will be deleted. The data collected from this research project will be stored on a protected computer. Only the principal investigator and faculty advisor will have access to the database. By electronically signing this form, you give permission for the use and disclosure of your information for purposes of this study at any time in the future."

CANCELLING THIS CONSENT AND AUTHORIZATION
You may withdraw your consent to participate in this study at any time. Because your identity is not linked with your answers, after completing the study, your responses cannot be removed from the data set at any time. If you cancel permission to use your information, the researchers will stop collecting additional information about you. However, the research team may use and disclose information that was gathered before they received your cancellation, as described above.

CONSENT:
I have read this Consent and Authorization form. I have had the opportunity to ask, and I have received answers to, any questions I had regarding the study. I understand that if I have any additional questions about my rights as a research participant, I may call (785) 628-4537, write the Office of Scholarship and Sponsored Projects (OSSP), Fort Hays State University, 600 Park St., Hays, Kansas 67601, or email irb@fhsu.edu.

I agree to take part in this study as a research participant. **By continuing with the study, I give my consent to participate in this study**. I understand that I can change my mind and withdraw from participation at any time without penalty. **By consenting to participate I affirm that I am at least 18 years old** and that I have been given the opportunity to print this consent form.

RESEARCHER CONTACT INFORMATION:

Victoria Medrano   Janett Naylor-Tincknell, Ph.D.
Principal Investigator   Faculty Supervisor
vsmedrano@mail.fhsu.edu
jmnaylor@fhsu.edu

Appendix C - Debriefing Form

Debriefing Form: "The Effect of Social Media on Anxiety, Reward Sensitivity, and Risk-Taking Behavior on Developing Brains"

Thank you for participating in "The Effect of Social Media on Anxiety, Reward Sensitivity, and Risk-Taking Behavior on Developing Brains". The purpose of this study was to examine the effect of social media, both in time and use, on the socio-emotional development of young adults. The information you have provided will be used to help researchers further understand the relationship between young adults and social media and how social media affects developing behaviors. This information will contribute to research on an age group that is often split between two different age groups and aid in identifying what aspects of social media may contribute to the studied behaviors.

The researchers greatly appreciate your help in this project and would like to thank you for taking the time to participate. If participation in this project has caused you distress, you can contact your local mental health care provider or National Alliance of Mental Illness (NAMI) at 800-950-6264. If you have questions about the process of this project, please contact the Office of Scholarship and Sponsored Projects at (785) 628-4537. If you have questions about the research project or would like more information, please contact the head researcher, Victoria Medrano or the faculty advisor, Dr. Janett Naylor-Tincknell.

Sincerely,

Victoria Medrano
vsmedrano@mail.fhsu.edu

Dr. Janett Naylor-Tincknell
jmnaylor@fhsu.edu
(Faculty Advisor)

Appendix D – Demographic Questionnaire

1. **Biological Sex**

1 - Male

2 – Female

3 – Prefer not to say

2. **Age** _____

3. **Ethnicity**

1 – Caucasian

2 – African American

3 – Asian/Pacific Islander

4 – Hispanic

5 – Native American/ Alaskan Native

6 - Other _____

4 **Number of active social media accounts (e.g., TikTok, Instagram, etc.):**

5 **How often do you check your social media accounts per day?**

6 **How long do you spend (in hours and minutes) on social media per day?**

7 **How long (in years) have you had at least one active social media account?**

Appendix E – Reward Sensitivity Measure

Please indicate the extent to which you agree or disagree with the statements listed below using

the following scale:

Very true for me	Somewhat true for me	Somewhat false for me	Very false for me
1	2	3	4

1. When I'm doing well at something I love to keep at it (RR)

2. When I get something I want, I feel excited and energized (RR)

3. When I see an opportunity for something I like I get excited right away (RR)

4. When good things happen to me, it affects me strongly (RR)

5. It would excite me to win a contest (RR)

6. If I think something unpleasant is going to happen, I usually get pretty "worked up" (BIS)

7. I worry about making mistakes (BIS)

8. Criticism or scolding hurts me quite a bit (BIS)

9. I feel pretty worried or upset when I think or know somebody is angry at me (BIS)

10. Even if something bad is about to happen to me, I rarely experience fear or nervousness (BIS)

11. I feel worried when I think I have done poorly at something (BIS)

12. I have very few fears compared to my friends (BIS)

13. When I want something, I usually go all out to get it (D)

14. I go out of my way to get things I want (D)

15. If I see a chance to get something I want, I move on it right away (D)

16. When I go after something I use a "no holds barred" approach (D)

17. I will often do things for no other reason than they might be fun (F)

18. I crave excitement and new sensations (F)

19. I'm always willing to try something new if I think it will be fun (F)

20. I often act on the spur of the moment (F)

RR = BAS Reward Responsiveness, D = BAS Drive, and F = BAS Fun Seeking

Appendix F – Social Anxiety Measure

Please indicate the extent to which you agree or disagree with the statements listed below using the following scale:

Not at all   Slightly   Moderately   Very   Extremely

1. I become anxious if I have to write in front of other people

2. I become self-conscious when using public toilets

3. I can suddenly become aware of my own voice and of others listening to me

4. I get nervous that people are staring at me as I walk down the street

5. I fear I may blush when I am with others

6. I feel self-conscious if I have to enter a room where others are already seated

7. I worry about shaking or trembling when I'm watched by other people

8. I would get tense if I had to sit facing other people on a bus or a train

9. I get panicky that others might see me to be faint, sick or ill

10. I would find it difficult to drink something if in a group of people

11. It would make me feel self-conscious to eat in front of a stranger at a restaurant

12. I am worried people will think my behavior odd

13. I would get tense if I had to carry a tray across a crowded cafeteria

14. I worry I'll lose control of myself in front of other people

15. I worry I might do something to attract the attention of others

16. When in an elevator I am tense if people look at me

17. I can feel conspicuous standing in a queue

18. I get tense when I speak in front of other people

19. I worry my head will shake or nod in front of others

20. I feel awkward and tense if I know people are watching me

Appendix G – Social Media Use Measure

Please indicate the extent to which you agree or disagree with the statements listed below using

the following scale:

| Strongly disagree | Disagree | Somewhat | Agree | Strongly Agree |

1. Social Networking Sites help me to feel less lonely (D)

2. I use SNS to pass time when I am bored (D)

3. SNS let me escape my worries (D)

4. I start using SNS when I have nothing better to do (D)

5. SNSs help me in research and studies (C)

6. SNSs help to search job/ online business/ scholarships (C)

7. SNSs help to gain knowledge (C)

8. SNSs give me information about others (C)

9. Using SNSs is one of the routine things I do when I'm online (A)

10. SNSs help me to express my emotions to others easily (A)

11. SNSs allow me to develop romantic relationships (A)

12. I use SNSs to talk about my problems and get advice (A)

13. SNSs is part of my self-image (PI)

14. SNSs portrays an image of me to others (PI)

15. People can use SNSs to judge me (PI)

16. I use SNSs to gain favorable approval among friends (PI)

17. SNSs allows me to communicate with my friends (SI)

18. SNSs allows me to stay in touch with family (SI)

19. SNSs enables me to find more interesting people than in real life (SI)

20. SNSs enables me to get through to someone who is hard to reach (SI)

D = Diversion Needs, A = Affective Needs, PI = Personal Integration Needs, and SI =

Social Integration Needs

Appendix H - Social Anxiety on Social Media Measure

All statements refer to the context of social media. Please indicate the extent to which you agree

or disagree with the statements listed below using the following scale:

Never   Rarely   Sometimes   Often   Always

1 I worry that people will evaluate me negatively (SEA)

2 I feel nervous when I have to talk with others about myself (IA)

3 I would be concerned if someone got access to my profile without my permission (PCA)

4 I worry about not living up to people's expectations (SEA)

5 I feel uneasy while making new friends (IA)

6 The possibility of publicly sharing my private information makes me feel anxious (PCA)

7 I feel worried about making a negative impression on others (SEA)

8 I feel worried when talking with people I have just met (IA)

9 I feel uneasy when my friends share my private information with people I don't know
   (PCA)

10 I am afraid that my close friends will not accept my behavior. (SCA)

11 I feel tense when I interact with someone on social media for the first time (IA)

12 I am worried that my friends will judge me in the presence of others over the content I
    have shared (SCA)

13 I feel nervous when talking with people I don't know that well (IA)

14 I would feel uncomfortable if my friends publicly expressed their disapproval about the
    content I have shared (SCA)

15 I am worried about being mocked by others because of the content I have shared (SCA)

16 I am afraid of interacting with others (IA)

17 I am worried about others disapproving of my behavior (SCA)

18 The possibility that others can take part of my private information makes me feel

anxious (PCA)

19 I am worried that the content I share will not be liked by others (SCA)

20 I feel worried about how companies behind social media handle information about my

private life (PCA)

21 I worry others might think that I do odd things (SCA)

NEA = Negative Evaluation Anxiety, IA = Interaction Anxiety, PCA = Privacy Concerns

Anxiety, and SCA = Shared Content Anxiety

Appendix I – Risk-Taking Measure

*For each of the following statements, please indicate the **likelihood** that you would engage in the*

described activity or behavior if you were to find yourself in that situation using the following

scale:

Extremely unlikely	Moderately unlikely	Neutral	Moderately likely	Extremely likely

1   Admitting that your tastes are different from those of a friend (S)

2   Going camping in the wilderness (R)

3   Betting a day's income at the horse races (F) 1.34

4   Investing 10% of your annual income in a moderate growth mutual fund (F)

5   Drinking heavily at a social function (H/S)

6   Taking some questionable deductions on your income tax return (E)

7   Disagreeing with an authority figure on a major issue (S)

8   Betting a day's income at a high-stake poker game (F)

9   Having an affair with a married man/woman (E)

10 Passing off somebody else's work as your own (E)

11 Going down a ski run that is beyond your ability (R)

12 Investing 5% of your annual income in a very speculative stock (F)

13 Going whitewater rafting at high water in the spring (R)

14 Betting a day's income on the outcome of a sporting event (F)

15 Engaging in unprotected sex (H/S)

16 Revealing a friend's secret to someone else (E)

17 Driving a car without wearing a seatbelt (H/S)

18 Investing 10% of your annual income in a new business venture (F)

19 Taking a skydiving class (R)

20 Riding a motorcycle without a helmet (H/S)

21 Choosing a career that you truly enjoy over a more prestigious one (S)

22 Speaking your mind about an unpopular issue in a meeting at work (S)

23 Sunbathing without sunscreen (H/S)

24 Bungee jumping off a tall bridge (R)

25 Piloting a small plane (R)

26 Walking home alone at night in an unsafe area of town (H/S)

27 Moving to a city far away from your extended family (S)

28 Starting a new career in your mid-thirties (S)

29 Leaving your young children alone at home while running an errand (E)

30 Not returning a wallet you found that contains $200 (E)

E = Ethical, F = Financial, H/S = Health/Safety, R = Recreational, and S = Social

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Thesis: The effects of social media on anxiety, reward sensitivity, and risk-taking behaviors on emerging adults

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