VIRTUAL WORLDS AFFORD SELF-ENHANCEMENT FOR NARCISSISM

by

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(Under the Direction of W. Keith Campbell)

ABSTRACT

Virtual worlds (i.e., those that are not physical but nonetheless real) such as social media, video games, and immersive virtual reality, are becoming increasingly common in all areas of our lives. Virtual worlds differ from our physical world by the affordances they provide—i.e., the features offered by virtual worlds combine with our motivations and abilities to create unique opportunities to pursue our goals. Narcissism has been widely studied with regard to virtual worlds, in part because virtual worlds appear to afford unprecedented opportunities to meet narcissistic self-enhancement needs. In the present volume, I present three published articles that each provide support for the hypothesis that virtual worlds afford self-enhancement for narcissism in a way the physical world cannot. The first is a meta-analysis of narcissism and social media use, showing that individuals high in narcissism use four features of social media significantly more often than those low in narcissism. The second is a study of how grandiose and vulnerable narcissists experience the process of taking selfies, and the third examines the role of narcissism in the recent trend of geek culture participation. Implications of this evidence are discussed, and avenues for future research are suggested, including the concept of a self-serving virtuality bias.

INDEX WORDS: Technology, Narcissism, Affordances, Media, Self-Regulation

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CHAPTER 1

INTRODUCTION

The philosopher Gilles Deleuz defined the virtual as that which is not physical but is nonetheless real (Ansell-Pearson, 2005). Although virtual worlds have always existed within our own (e.g., many memories and cognitive experiences can be considered virtual under this definition), the distinction between real and virtual is becoming increasingly relevant to our modern world. Technological advancement has yielded an increasing number of computer-mediated virtual worlds, such as those occurring in social media, video games, and the recent advent of immersive virtual environments (IVEs). The actions, communications, and experiences that take place in these new environments are considered more real by some than by others (Snell, 2017), but when embraced as real (with real consequences for one's identity and future) they present unprecedented ways for psychological processes to play out differently than they do in the real (physical) world.

An example of such processes is self-enhancement. Almost all individuals are motivated to self-enhance to influence both their own and others' impressions of them (Sedikides & Gregg, 2008). However, the personality trait narcissism is especially associated with self-enhancement (e.g., Campbell, Reeder, Sedikides, & Elliot, 2000), and is often conceptualized as a self-regulating process in which individuals use self-enhancement behaviors to elicit feedback consistent with their inflated self-concepts (e.g., Morf and Rhoewalt, 2001; Campbell and Foster, 2007). Narcissism has been increasingly prevalent in younger generations (Twenge, Konrath, Foster, Campbell, & Bushman, 2008; although this trend has recently reversed; c.f. cite) and has

been widely studied with regards to social media use (Campbell & McCain, in press) as well as some gaming research (e.g., Weiler, 2016). A pattern has emerged of people high in narcissism using such virtual environments differently and more often than those low in narcissism (McCain & Campbell, 2016). This suggests that virtual environments may provide opportunities to self-enhance (and thus regulate narcissism) that are not present in real environments, and that individuals high in narcissism may be more likely (or better equipped) to exploit these opportunities to their benefit.

The present dissertation presents three published articles that provide supporting evidence for the above assertion, using well-established quantitative and qualitative methods to detect traces of narcissism in virtual environments (see Figure 1). Although these studies do not contain experiments (and thus do not prove any causal assertions), they show broad patterns across multiple samples that suggest a) higher instances of engagement with virtual worlds associated with higher narcissism, b) distinct patterns of engagement with virtual worlds that are associated with self-enhancement motives and that change with the type of narcissism and c) personality traits that may coexist with narcissism that could increase the likelihood to regard virtual worlds as real. However, we first turn to a discussion of virtual environments and the opportunities they afford, as well as a more in-depth explanation of the definition and study of narcissism.

What Makes Virtual Worlds Different?: Situational Affordances

If virtuality is defined as being nonphysical but real, the term virtual worlds can be applied to environments that lack physicality but are nonetheless treated as real by individuals. The most obvious of these is IVEs, in which a head-mounted display (HMD; e.g., HTC Vive, Oculus Rift) and various forms of audio or haptic feedback are used to provide the illusion of being in a non-existent physical space. Individuals can interact with the environment to elicit

responses similar to real-life environments (e.g., they can pick up a ball with a virtual hand and throw it) which they may discuss and regard as a "real" experience (e.g., "In the golf world, I picked up a ball and threw it."). However, less sophisticated technological mediation can also produce environments such as gaming worlds (which can vary from full IVE to a text-based adventure) that nonetheless can provide a similar response ("In the game, I slew a dragon."). In addition, social media environments may be considered virtual environments, as one "talks to one's friends" and "visits their wall" on Facebook. A virtual world might even be as crude technologically as the worlds created by tabletop roleplaying games such as *Dungeons and Dragons*, where the mediation is through maps and dice, or even highly interactive fanships such as the *Harry Potter* fandom, in which individuals identify and recognize each other as belonging to a house (e.g., *Gryffindor, Slytherin*) and having a particular type of familiar or wand. In such fantasy-based worlds, there is a set of agreed-upon truths considered to be "canon," and thus are immutable realities within that world. This consistency allows the world to be shared by disparate people, thus improving the escapism provided by that world (Mizer, 2013).

Common to all the above environments is that they are not dependent on physical reality. Thus, they make it possible to accomplish real behaviors that one cannot do in the physical world. For example, in the popular MMORPG *World of Warcraft*, one can in fact slay a dragon, even if the dragon did not exist in physical space; although some may diminish its importance because it was a virtual dragon, few would argue that it did not count in some way as an action. In both the fields of media and psychology, the possibilities provided by an environment are often described in terms of *affordances*.

The concept of affordances was first presented by Gibson (1986) in the framework of ecological psychology to describe how individuals perceive objects in their environment. Gibson argued that rather than perceiving only the physical aspects of an object, animals (including people) perceive an object in part by what uses it provides, or "affords," to them to fulfill their needs. The perceived affordances differ based on both the individual and the object. For example, a human walking in the woods may perceive a rock on the ground as a potential weapon or tool; a snake, having no arms, would instead perceive the rock as a place to hide.

Over time, Gibson's concept has been clarified as referring to a unique, dynamic relationship that arises between an individual and an object during interactions (e.g., Norman, 1999). In this view, an affordance is neither inherent to the object nor to the individual, but is instead a combination of the object's properties, the individual's present needs, and the individual's ability to perceive that the object could meet his or her needs. Evans and colleagues' (2016) described this relationship between individual agency and an object's properties (for example, searchability) as a link between the permanent features of an object (e.g., posting pictures on a social media site) and an outcome (e.g., specific others finding the picture).

Under this definition then, a feature of a virtual world, for example the posting of pictures on Instagram, might be perceived and used differently by two different individuals (e.g., the author and celebrity Kim Kardashian). The author presumably has less motivation to self-enhance than does Kim, who is known for publishing a book of her selfies (Hahn, 2016) and wearing a jacket adorned with her own face (Roy, 2016). Thus, while the author may see posting pictures as a way to share personal information with friends (e.g., pictures of her pet snakes), Kim may see the opportunity to show to a wide audience self-enhancing photos of herself in expensive clothing. This leads to two separate outcomes, with a few interested parties staying up
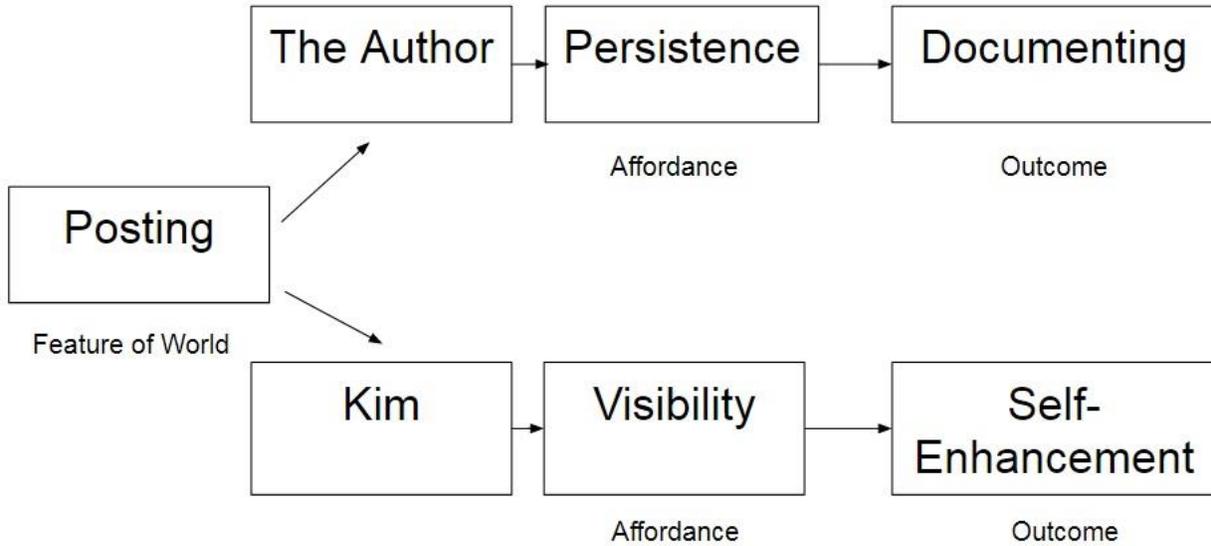
Figure 1. The same action combined with different individuals can lead to different affordances and thus, different outcomes.

to date on the author's pets, while the public develops a perception of Kim Kardashian as glamorous and rich (see Figure 1). Under the definition provided by Evans and colleagues

(2016), this would result in two separate affordances; the author's posting and subsequent documentation of her snakes' exploits yielding *persistence*, and Kim's posting and subsequent popularity yielding *visibility*.

As seen above, individuals with different motives can use the same technology to accomplish different actions that are not equally possible in the physical world. The relative permanence of posts made on social media allows the author to preserve a curated string of documented events that are visible to others even when she is not present (via the affordance of persistence), whereas the access to an unlimited, worldwide audience allows Kim to self-enhance to more individuals than she would ever physically be able to interact with in real life (via the affordance of visibility). As Gibson's theory of affordances focuses specifically on motivation, it is possible that individuals with chronically different motivations (i.e., those brought about by

individual differences variables) may even differ in their ability to notice and exploit the same features of virtual worlds. As we will see in the narcissism literature, there is evidence that individuals high in narcissism are more attentive to opportunities to self-enhance and may even be more skilled at using such opportunities for that purpose than those low in narcissism.

Narcissism and Virtual Worlds

Narcissism as discussed here is a personality trait associated with grandiosity, a sense of entitlement and superiority to others, and a lack of empathy (Miller et al., 2011). Distinct from Narcissistic Personality Disorder (NPD), narcissism has most often been characterized as a cyclical process in which narcissistic individuals engage in specific behaviors to elicit positive feedback from others. This feedback both maintains a grandiose sense of self and reinforces those same behaviors (see Figure 2; Morf and Rhoewalt, 2001; Campbell and Foster, 2007), leading to their repetition. *Grandiose narcissism*, the more overt and extroverted form (Miller et al., 2011), pursues this feedback in a more approach oriented fashion, and shows higher levels of behavioral activation (Foster & Trimm, 2008). *Vulnerable narcissism*, a more covert and neurotic form, shows levels of both behavioral activation and inhibition, leading to the outward appearance of ambivalence and low self-esteem concealing a grandiose and entitled interior. However, to an extent, both processes make use of the same repertoire of behaviors and biases to support an unrealistic self-concept in the face of disconfirmatory feedback.

Morf and Rhodewalt (2001) describe these behaviors in terms of *intrapersonal* and *interpersonal* strategies. Intrapersonal strategies take place within the individual's mind, and include self-enhancing biases in perception that allow the individual to discount negative feedback about the self and enhance positive information about the self. Examples of these
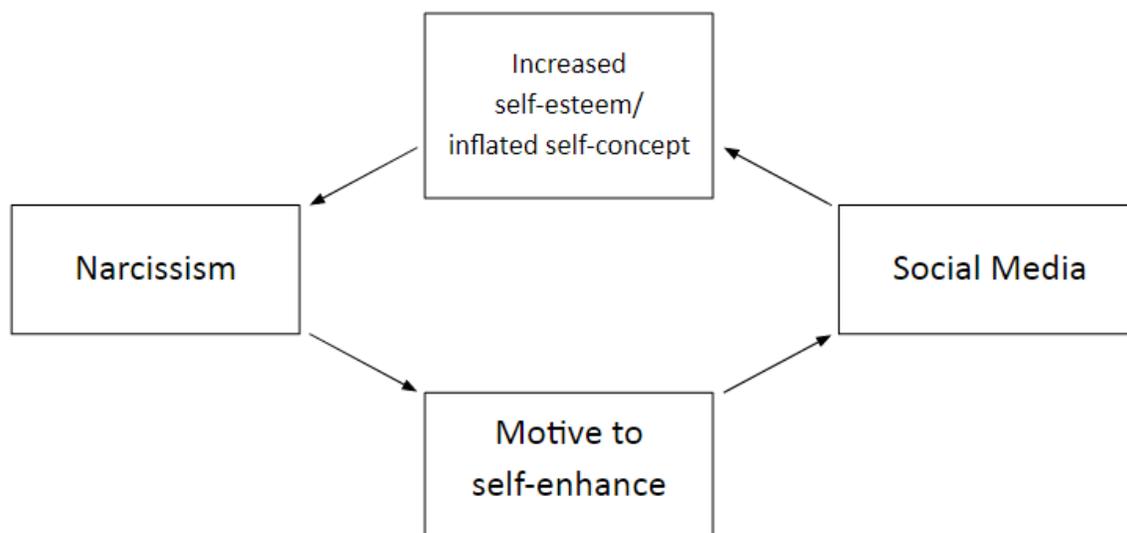
Figure 2. The feedback loop whereby narcissism is regulated and maintained using social media.

strategies include attributing positive outcomes to the self even if outcomes weren't dependent on performance (Rhodewalt & Morf, 1998), blaming others for failure (Campbell et al., 2000), biased recall of events (e.g., remembering more positive dating experiences; cite), overconfidence in abilities and future performance (e.g., in gambling; Campbell, Goodie, & Foster, 2004), and devaluing or punishing sources of negative feedback (Kernis & Sun, 1994). They may subconsciously suppress feelings of worthlessness (Horvath & Morf, 2009) and guard against threats to the ego by fantasizing about personal achievements, real or imagined (Raskin & Novacek, 1991). On the other hand, interpersonal strategies take place socially, and include the narcissistic individual's attempts at eliciting feedback from others that is consistent with their self-concept. For example, narcissistic individuals may brag more (Paulhus, 1998), claim to hold knowledge they do not (Paulhus, Harms, Bruce, & Lysy, 2003), engage in grandiose, attention-seeking behavior (Buss & Chiodo, 1991), and adorn themselves with flashy clothing or expensive possessions in order to garner praise (Vazire, Naumann, Rentfrow, & Gosling, 2008;

Sedikides, Cisek, & Hart, 2011). They are more likely to take a leadership role in ambiguous situations, dominate conversations, and engage in game-playing to maintain power in romantic relationships (Campbell, Brunell, & Finkel, 2006). In particular, those high in narcissism appear to thrive in shallow, short-term, and distant social relationships, like those fostered by social media. Chiefly those high in narcissism are concerned with how they appear to others, going to greater lengths to control self-presentation than those low in narcissism.

Perhaps most notable about these strategies is that, while most people have a tendency to self-enhance (Sedikides & Gregg, 2008), those high in narcissism appear to devote special effort to finding, creating, and exploiting opportunities to do so. Such individuals try harder and thus perform better when their performance is being evaluated or when there is an opportunity to self-enhance or show off (Wallace, Ready, & Weitenhagen, 2009; Wallace & Baumeister, 2002). They may even be more attentive to opportunities to self-enhance on a perceptual level, ramping up their self-enhancing biases when given the opportunity to view their own performance from a third person perspective (Robins & John, 1997). Virtual environments provide a similar opportunity to self-enhance, which individuals high in narcissism are well motivated and equipped to notice.

Virtual environments allow narcissistic individuals a chance to circumvent the ways in which physical reality has checked their self-enhancement. Social media has allowed individuals with narcissism to broadcast a carefully tailored appearance to more people, more often, and with quicker (and often limited to positive) feedback than ever before (e.g., McCain et al., 2016). Gaming and fantasy media allow them to ward off threat by immersing them in fantasies in which they can be powerful, admired, and desired (e.g., as powerful protagonists in an action story; McCain, Gentile, & Campbell, 2015). The affordances that occur when a narcissistic

individual's focus on self-enhancement mixes with features of his environment that transcend time, space, and physical ability will be discussed in the next section. These affordances magnify narcissism and allow for an unprecedented ability to buttress a grandiose self in times when threats to financial security and belonging threaten to deflate individual self-regard.

Affordances That Aid Self-Enhancement

Although there is a potentially infinite number of affordances arising from combinations of individuals and features, several common affordances have been identified in the media literature. Following are a list of affordances that have the potential to aid self-enhancement. This list will undoubtedly change as new virtual worlds emerge and the features of existing virtual worlds change. However, these affordances provide an image of how virtual worlds can afford greater opportunities for narcissistic individuals to self-enhance and maintain their grandiose sense of self.

Anonymity/Identity Multiplicity

Virtual worlds afford varying levels of anonymity, from the limited, curated window into one's identity seen through social media to complete anonymity through avatars, screen names, or even the assignment of a generic identity or character (e.g., Evans et al., 2016; Jiow & Lim, 2012). This anonymity provides unprecedented control over the amount and presentation of information given to others, allowing would-be self-enhancers to emphasize positive attributes, hide negative attributes, or adopt a different identity altogether. For example, past research shows that while social media profiles are a reasonable proxy of an individual's true personality (Gosling, Augustine, Vazire, Holtzman, & Gaddis, 2011), they represent an embellished version of that person's life with unflattering moments or failures removed (Gosling, Gaddis, & Vazire, 2007). Individuals high in narcissism may post pictures and statuses that are more self-

enhancing, using full-body poses (McCain et al., 2016), more "I" and "me" words (DeWall, Buffardi, Bonser, & Campbell, 2011), and association with numerous others (McCain & Campbell, 2016) more often than those low in narcissism, and these attempts to sell the self are detectable as narcissism by other individuals (Buffardi & Campbell, 2008). In a more anonymous virtual world such as a video game, an individual may adopt an identity that is more in line with their ideal self than their real self, such as a powerful hero or an attractive avatar (e.g., Przybylski, Weinstein, Murayama, Lynch, & Ryan, 2012).

Visibility

The ease of locating and viewing information online coupled with the intention to make that information visible is known as the affordance of visibility (Treem & Leonardi, 2013; Evans et al., 2017). Although the intention of most social media is to make behavior visible, such visibility still varies based on the intent of the individual. For example, Facebook profiles can be private or not. Individuals can curate which of their friends see which of their posts and status updates, using groups and varying levels of "friend" status, and can even hijack some of Facebook's algorithms to make statuses more available in others' newsfeeds (e.g., by using the word "congrats" in their post, regardless of its content). Such options can provide those high in narcissism with the ability to further curate what information is seen by whom, or to ensure their message reaches a wider audience. By posting frequently and by posting what Facebook considers important, individuals wishing to self-enhance can stay visible in others' newsfeeds without others having to go out of their way to search or view their profile. This keeps them in sight and thus in others' minds, and in groups that are particularly reliant on social media (such as younger generations), this visibility can make the difference between being considered for jobs or invited to parties and being passed over.

Persistence

Due to their tendency to be technologically (or in some cases, physically; i.e., *Dungeons and Dragons* roleplaying games) mediated, virtual worlds provide the feature of recording conversations, comments and images for an indefinite period of time. When combined with the intention to make communications last, we have the affordance known as persistence (Treem & Leonardi, 2013; Evans et al., 2017). Persistence can be used by those who wish to self-enhance by allowing them to reach a greater audience than they could have with face-to-face communication, which is limited by time. On most social media platforms, for example, if an individual wishes to livestream an activity or event, they can then post the recorded video of the event so that individuals who could not watch the livestream can come back to it later, making it available to a wider audience. Persistence also makes possible asynchronous communication, in which each individual can post a response to the other individual at varying time intervals, eliminating the need to be available at the same time. A hidden advantage to asynchronous communication, however, is the possibility of taking time to carefully plan and edit what one says, carefully stage, crop and filter one's pictures, and in general curate what one reveals, which is not possible in real time. Individuals may even edit their posts before the other individual sees them, provided their recipient doesn't read it right away. This can be a valuable resource for narcissistic individuals, especially those high in vulnerable narcissism, who may be more cautious about editing their communications before posting them (see Chapter 3). Low persistence may also be an asset, as shown with the popular social media platform Snapchat, which deletes chats and pictures shortly after they are viewed. This type of asynchronous but still ephemeral communication provides the opportunity to reach individuals not present in real time, but still avoid the embarrassment of one's statements being recorded indefinitely. Persistence is

not unique to social media platforms, as individuals' achievements, actions, and choices in video games and other virtual environments are often recorded and made visible to others. For example, the popular video game *Halo* provides a public "service record" for each player, showing their kills, battles fought, and current level for others to admire.

Fantasy Migration

In the fourth chapter in this dissertation, McCain, Gentile, & Campbell (2015) posed the Great Fantasy Migration hypothesis to describe the motivation behind participation in Geek culture, including gaming culture. They proposed that due to increasing trends in cultural narcissism (i.e., the expectation that everyone should be "special") in the United States (Twenge, Konrath, Foster et al., 2008), individuals have greater needs for the admiration, power, and fame needed to support a narcissistic sense of self. Faced with a decreased availability of this "narcissistic supply" in the physical world, individuals high in narcissism may migrate to virtual worlds that afford greater opportunities to fulfill their needs. Distinct from identity multiplicity, fantasy migration allows narcissists to avoid experiencing identity threat from their real lives by escaping into a fantasy world in which it is easier to maintain a grandiose self-concept. For example, although achievement and material success may be limited to a few individuals in real life, in most video games they are achievable for all players provided enough time and effort are spent--in other words, everyone can reach the highest level in *World of Warcraft* if they play long enough. In addition to in-game achievement, fantasy games offer opportunities to be powerful (e.g., by using magic), to have authority (e.g., by taking charge of a guild or other in-game organization), and to be attractive (i.e., via avatars) that are not physically possible in real life. These benefits may also be available in a lesser degree through consuming less interactive forms of fantasy media, as individuals fantasize about being members of the *Star Trek* universe,

being a *Jedi* or a *Sith*, or belonging to a *Harry Potter* House such as Gryffindor or Slytherin. These fantasies may be acted out via cosplaying (i.e., wearing accurately rendered costumes of fictional characters), writing fanfiction, or collecting and wearing merchandise (e.g., buying one's own lightsaber or wizard wand). McCain, Gentile and Campbell (2015) found a positive relationship between narcissism and participation in fantasy media, suggesting that fantasy migration may be a major reason for the popularity of such activities. They also found positive relationships with extraversion, openness to experience, and low neuroticism, traits associated with a greater ability to use the next affordance, presence.

Presence

Presence can be best defined as the illusion of technological nonmediation (e.g., Lombard & Ditton, 1997) or the perception of "being there" in the virtual world (Biocca, 1997). Greater levels of perceived presence are associated with higher levels of interactivity (i.e., the ability to elicit realistic responses from the world with one's' actions; Heeter, 2000), richness (i.e., the fidelity of sensory stimulation provided by the environment; Steuer, 1999), and immersion (i.e., the ability of the simulated environment to replace or block out the real world; Lombard & Ditton, 1997); thus, more technologically sophisticated virtual environments may be able to produce more presence (Lee, 2004). However, although advanced technology can aid in creating presence in a virtual world, individuals also differ in their susceptibility to feeling presence. Individuals high in openness, extraversion, and low neuroticism are more prone to experience presence (Weibel, Wissmath, & Mast, 2010), as are individuals high in fantasy proneness (Sas & O'Hare, 2003). Such individuals are more likely to engage with fantasy media (Lynn & Rhue, 1988; McCain, Gentile, & Campbell, 2015), and if they are also high in narcissism, they may better be able to use fantasy media for self-enhancement and regulation of a narcissistic self than

individuals lower in narcissism. The better they are able to feel truly "there" in the virtual world, whether it is a social media platform, a video game, or a fantasy media world, the better they are able to "forget" the real world outside of the media, and thus forget threats to the self. Having forgotten threats to the self, they may then be able to more confidently promote their grandiose identity in the virtual world.

The Present Dissertation

In the present volume, I present three papers that provide supporting evidence to the above discussion on affordances and narcissism. Chapter 2 (McCain & Campbell, 2016) is a meta-analysis of 62 samples from 29 different papers establishing that grandiose narcissism is positively related to social media use. This analysis shows that grandiose narcissism is positively related to 1) time spent on social media; 2) the frequency of status updates; 3) the number of friends an individual has on social media; and 4) how frequently they post selfies to social media. Although the data was disproportionately gathered from Facebook and Twitter, these relationships suggest that individuals high in narcissism are more likely to use these four strategies, each of which can increase the affordance of visibility on a social media website. Chapter 3 (McCain et al., 2016) reports two studies using self-report and qualitative data to explore the process used by those with grandiose and vulnerable narcissism, along with the Dark Triad traits psychopathy and machiavellianism, to take and post selfies (i.e., pictures taken of oneself) to the platform Instagram. Results show a slightly different pattern for grandiose and vulnerable narcissism; to further probe these effects, I ran a series of two-tailed Fisher-to-z transformations to test for significant differences between relationships for grandiose and vulnerable narcissism. Grandiose narcissism showed a significantly higher positive relationship to the number of selfies posted per day in Sample 1 ($z = 3.22$, $p < .01$), and was significantly

more positively related to self-reported leisure motives ($z = 2.24$, $p < .05$) in Study 1. Vulnerable narcissism was significantly more positively related to self-reported belongingness ($z = 3.70$, $p < .01$), self-presentation ($z = 2.23$, $p < .05$), and conformity ($z = 2.56$, $p < .05$) motives in Study 2. Across both studies, vulnerable narcissism was significantly more positively associated with self-reported negative emotions across the selfie process (except when receiving likes; zs = 2.06 – 4.05, $p < .05$, whereas grandiose narcissism was significantly more positively associated with self-reported positive emotions when taking ($z = 3.34$, $p < .01$) and receiving negative feedback ($z = 2.42$, $p < .05$) on selfies in Study 1. These new analyses suggest that there is not enough evidence to assume the selfie taking process differs in relation to grandiose or vulnerable narcissism; however, those high in vulnerable narcissism appear to experience the selfie-taking process differently from those high in grandiose narcissism, possibly leading to fewer selfies posted overall. This is consistent with the view of vulnerable narcissists as being high in both approach and avoidance motivation with relation to self-enhancement; individuals high in vulnerable narcissism reported significantly more negative emotions than those with grandiose narcissism when taking and posting selfies, and thus were more likely to take advantage of persistence and anonymity to ensure they gained visibility without risking rejection or embarrassment. Chapter 4 (McCain, Gentile, & Campbell, 2015) describes seven studies conducted to explore possible motivations for engaging in Geek Culture, a self-named culture built around the consumption of fantasy and science fiction media. Although creativity and thwarted belongingness also emerged as motivations for participation, narcissism maintained a consistent positive relationship with engaging in geek activities (e.g., gaming, cosplay, tabletop roleplaying gaming, writing fanfiction, collecting merchandise), suggesting that participants were engaging in geek activities at least in part because of fantasy migration. Participants also

showed high levels of fantasy proneness, extraversion and openness to experience, which are associated with the ability to experience presence (Sas & O'Hare, 2003; Weibel, Wissmath, & Mast, 2010). These results suggest strongly that individuals who are high in narcissism and are thus motivated to self-enhance are more likely to engage in fantasy activities which allow them to use identity multiplicity and presence to migrate to a virtual world where they can more easily receive narcissistic supply and avoid experiencing threats to the self. In Chapter 5, I will discuss suggestions for further study of narcissism and media use, including the concept of a self-serving virtuality bias, meaning that environments, actions, and identities that provide flattering feedback for the self may be considered more "real" than environments that do not, regardless of their level of mediation or simulation. This concept will be an important one in a world where social life is increasingly online, and work life is increasingly gamified, further blurring the lines between "reality" and "virtuality."

CHAPTER 2

NARCISSISM AND SOCIAL MEDIA USE: A META-ANALYTIC REVIEW

Introduction

Does narcissism relate to social media use? Or is the power to selectively present oneself to an online audience appealing to everyone, regardless of their level of narcissism? Social media websites such as Facebook, Twitter, or Instagram can sound like a narcissistic dream. In seconds, one can share self-enhancing content—flattering pictures, boastful statuses—with a potential audience of millions and receive immediate feedback in the form of "likes" and comments from followers. One can share as little or as much as one wants to present exactly the self-image one desires. To date, Over 60 studies have endeavored to answer this question, but with mixed results. In this meta-analytic review, we try to more precisely quantify and characterize how narcissistic individuals interact with social media.

We focus on answering the following questions: 1) Do those high in grandiose (a more callous, extraverted form of narcissism; Miller, Hoffman, Gaughn, Gentile, Maples, & Campbell, 2011) and vulnerable (a more neurotic, introverted form) narcissism spend more time on social media than those low in narcissism? 2) Do those high in grandiose and vulnerable narcissism use the features of social media (i.e., adding friends, status updates, and posting pictures of oneself) differently from those low in narcissism? And 3) Do those high in vulnerable narcissism use the features of social media differently from those high in grandiose narcissism? To better answer these questions, we describe major theoretical models of the relationship between narcissism and social media behavior.

Review of Narcissism and Social Media

    Defining Narcissism

    We define narcissism as a dimensional personality trait that consists of a grandiose self-concept as well as behaviors intended to maintain this self-concept in the face of reality (e.g., Emmons, 1984; Morf & Rhodewalt, 2001). Separate from Narcissistic Personality Disorder (NPD; American Psychiatric Association, 2013), trait narcissism exists across the normal (nonpathological) population and is associated with both positive (e.g., leadership, Rosenthal & Pittinsky, 2006; and subjective well-being, Sedikides, Rudich, Gregg, Kumashiro, & Rusbult, 2004) and negative (e.g., aggression, Bushman & Baumeister, 1998; and low commitment in relationships, Campbell & Foster, 2002) outcomes. Narcissists – a term we use as a shorthand for those as scoring higher on inventories of narcissistic personality – are known to seek out attention and praise, and because their larger-than-life self-views are often in conflict with reality, narcissists employ interpersonal strategies such as bragging (Buss & Chiodo, 1991), affiliating with high-status others (Campbell, 1999; Horton & Sedikides, 2009), and other self-promotional behaviors as well as intrapersonal strategies such as downward social comparison (Campbell, Reeder, Sedikides, & Elliot, 2000) and self-serving attributions (Rhodewalt & Morf, 1998) to maintain high self-esteem. The origins of narcissism are unknown, but some theorists suggest it may be an outgrowth of personal trauma (e.g., Young & Pinsky, 2006; Pinsky & Young, 2009).

    Narcissism has two forms that have been studied in the literature, grandiose and vulnerable (Cain, Pincus, & Ansell, 2008). *Grandiose narcissism* is the extraverted, grandiose and callous form of narcissism. It also is the form that has garnered the most research attention. *Vulnerable narcissism* is the more introverted, neurotic form that is less well studied (Miller, et

al., 2011). This distinction in the literature between grandiose and vulnerable narcissism shares

some parallels with Freud's (1914) distinction between primary and secondary narcissism. In

Freud's model, primary narcissism was the basic self-love experienced by the typical child. With

development, much of this primary narcissism was then projected onto the representation of

another person ("an object"), an image of the self, or it withdrawn back into the self, such as in

the case of delusions of grandeur coupled with psychological withdrawal. Each of these are

"secondary" narcissism because they follow from the primary narcissism. Given this, grandiose

narcissism conceptually suggests some residual primary narcissism but also can reflect some

secondary narcissism as psychic energy is attached or "cathected" to the self-image. Vulnerable

narcissism, however, conceptually linked to secondary narcissism, as it is also characterized by

low self-esteem and withdrawal in the form of social introversion (e.g., Hendin & Cheek, 1997).

While this link between grandiose and vulnerable narcissism and primary and secondary

narcissism has not been tested directly in the literature (there are no existing measures of primary

and secondary narcissism), there are measures of primary and secondary psychopathy and these

do correlate more with grandiose and vulnerable narcissism, respectively (Miller, Dir, Gentile,

Wilson, Pryor, & Campbell, 2010). In the present meta-analysis, we differentiate between

grandiose and vulnerable narcissism, rather than primary and secondary narcissism, as is done in

the literature.

　　Narcissism is increasingly considered a feature of modern society (Twenge & Campbell,

2009) and of recent generations (Twenge, 2007). Narcissism scores have been shown to be

increasing over time (Twenge, Campbell, & Gentile, 2012; Twenge, Konrath, Foster, Campbell,

& Bushman, 2008; cf. Grijalva, Newman, Tay, Donnelan, Harms, Robins & Yan, 2014) and

popular media often credits this trend for the popularity of social media websites such as

Facebook, Twitter, and Instagram (e.g., Diller, 2015; NPR Staff, 2015), although there is not solid empirical evidence for the latter. These media platforms allow individuals to broadcast information about themselves to a wide audience at any given time—ostensibly appealing to people's growing desire for attention and praise—but they also can provide opportunities for other needs such as belongingness, which is believed to be a universal need (Baumeister & Leary, 1995) and to be increasingly lacking in our modern society (Putnam, 2001). Narcissism can operate at a cultural as well as individual level, resulting not only in the increase in individual traits such as narcissism and contingent self-worth but also in the social acceptability of related behaviors (e.g., contingent self-esteem leading to posting more pictures on social media; Stefanone, Lackaff, & Rosen, 2011). However, the data in this review do not speak to narcissism as a cultural variable, and thus our focus will be on the relationship between individual narcissism and social media use.

Theoretical Models Relating Elevated Social Media Use Among Those High in Narcissism

There are three general classes of theoretical models that predict elevated social media use on the part of narcissistic individuals. We refer to these as: s*elf-enhancement*, *fit* and *trait* models. According to the *self-enhancement model* (e.g., Buffardi, 2011; Campbell, 1999; Morf & Rhodewalt, 2001) social media can be a useful platform for promoting and enhancing the self (Buffardi & Campbell, 2008), so narcissistic individuals will be drawn to social media to fulfill self-enhancement needs. For example, the dynamic self-regulatory processing model of narcissism (Morf & Rhodewalt, 2001) conceptualizes narcissism as having a goal of self-esteem regulation or self-enhancement. In order to maintain an unrealistically grandiose sense of self, narcissists must engage in interpersonal strategies to obtain self-affirming feedback from their environment. Similarly, the agency model of narcissism (Campbell & Foster, 2007; Campbell,

Brunell, & Finkel, 2006) describes narcissism as a system of mutually reinforcing traits, skills, and behaviors that is self-sustaining but has no overarching goal. This conceptualization suggests that the narcissistic patterns of behavior seen on social media come about because of favorable conditions that trigger and are conducive to narcissism. Social media will be "sticky" for narcissistic individuals because once involved the narcissistic individual will find a reasonably favorable environment for gaining admiration and esteem and generally reinforcing the narcissistic self.

A second model is a *fit model*. Essentially, social media encourages wide but shallow social networks that are a good fit for narcissistic skills and abilities. For example, individuals high in grandiose narcissism are known to prefer emotionally shallow social relationships and like to publicly associate themselves with high status others (Campbell, 1999). They make good first impressions (Back, Schmukle, & Egloff, 2010; Paulhus, 1998) and are often seen as more attractive (Holtzman & Strube, 2010; Vazire, Naumann, Rentfrow, & Gosling, 2008). Likewise, because narcissists enjoy having social influence, they tend to occupy more central positions in their social networks (Clifton, Turkheimer, & Oltmanns, 2009). Given this along with the finding that having more attractive friends on your Facebook page gives observers a positive impression (Tong, Van Der Heide, Langwell, & Walther, 2008), it is reasonable that grandiose narcissism is consistently associated with having more friends on social media sites (e.g., Davenport et al., 2014; Garcia & Sikström, 2014).

Finally, the basic personality traits associated with narcissism suggest a *trait model* of narcissism. In Big Five terms, grandiose narcissism is comprised of high extraversion and openness and low agreeableness (Miller et al, 2011), and extraverts have been shown to have larger social networks in general (Pollet, Roberts, & Dunbar, 2011; Roberts, Wilson, Fedurek, &

Dunbar, 2008) and spend more time and generate more content on social media sites (Gosling, Augustine, Vazire, Holtzman, & Gaddis, 2011). Thus, narcissists' tendency to have more friends and generate more content on social media may, in part, be linked their extraversion. In contrast, vulnerable narcissism is associated with low agreeableness and neuroticism, which suggests more anxiety or discomfort associated with social media use. In basic motivational terms, we see a similar pattern. For example, the Unmitigated Approach Model (UAM; Campbell et al., 2006; Foster & Trimm, 2008) describes grandiose narcissists as much more sensitive to and motivated by potential reward than by potential punishment. This creates a tendency toward approach-oriented social behavior (Foster, Misra, & Reidy, 2009), which may explain why those high in grandiose narcissism generate more content (Buffardi & Campbell, 2008; Mehdizadeh, 2010; Poon & Leung, 2011)—especially self-promoting content (e.g., Buffardi & Campbell, 2008; Mehdizadeh, 2010)—with relatively little concern for privacy (Smith, Mendez, & White, 2014; Utz & Kramer, 2009) on social media sites. In contrast, vulnerable narcissists, who are high in both approach and avoidance motivation (Foster & Trimm, 2008), are more cautious about obtaining praise, showing more concern for privacy (Ahn, Kwolek, & Bowman, 2015) and putting more effort into impression management (i.e., taking multiple selfies before picking one and cropping and editing pictures) than grandiose narcissists (McCain et al., 2016). This suggests that traits associated with grandiose narcissism are perhaps a better fit for social media than those associated with vulnerable narcissism.

Findings and Potential Moderators

Does narcissism truly lead to more social media use, and do those high in narcissism use social media differently than those low in narcissism? Despite the theoretical reasons to expect such differences, findings have been mixed with regards to whether narcissists do (e.g., Fox &

Rooney, 2015; Vieth & Kommers, 2015) or do not (e.g., Bergman, Fearrington, Davenport, & Bergman, 2011; Buffardi & Campbell, 2008) spend significantly more time on social media websites than non-narcissists. This variability suggests that the effect size is small, or that there are moderators of the effects that have not been uncovered. Thus, our review looks at several potential theoretical moderators: birth cohort (i.e., the generation a participant belongs to, which presumably shares a particular set of sociocultural experiences; see Caspi, 1987), culture and platform. These are discussed below. We also examined other potential moderators such as age and gender composition of the sample.

Birth Cohort. Age differences in the relationship between narcissism and social media use could reflect either generational or developmental effects (we do not have sufficient cross-lagged data to tease these two apart). In terms of generations, the research on narcissism and social media in the United States focuses primarily on two different generations. Gen Xers, who would correspond to the MTurk samples in this review, are primarily in their 30s and 40s. In Gen Xers narcissism has been shown to be associated with Facebook use (Davenport, Bergman, Bergman, & Fearrington, 2014), particularly the superiority (Panek, Nardis, & Konrath, 2013), vanity, exhibitionism, and exploitativeness (Leung, 2013) facets of narcissism. Millennials, or Generation Y, are primarily in their 20s and have lived an internet-saturated existence for most of their lives (Tapscott, 1998; Twenge, 2007). Studies often find no relationship between narcissism and social media use in this generation (Bergman et al., 2011; Davenport et al., 2014; Leung, 2013), although Panek et al. (2013) found a relationship between the superiority facet of narcissism and Twitter use as well as between the exhibitionism facet and Facebook use in college students. These differences, however, could also be the result of development. It is

plausible that self-enhancing type behaviors on social media (e.g., selfies) are more a product of social norms in younger samples but become more strongly associated with personality in older individuals.

      Culture. Narcissism's inconsistent relationship to social media usage may also be due to cultural differences. Firstly, there is ample evidence that narcissism differs in both prevalence and presentation across cultures. Cultures that are high in individualism (Hofstede, 1980), such as the United States, value individual autonomy more highly than cultures high in collectivism, such as cultures in Asia (see Oyserman, Coon, & Kemmelmeier, 2002 for a review of individualism/collectivism across countries). Individualistic countries show higher levels of narcissism than collectivistic countries (Foster, Campbell, & Twenge, 2003) with China as a possible exception (Miller et al., 2015) and narcissistic behaviors such as self-enhancement manifest differently in collectivistic cultures than in individualistic ones (i.e., individuals in collectivistic cultures self-enhance on communal rather than agentic traits; Sedikides, Gaertner, & Toguchi, 2003). Some researchers even suggest that narcissism itself may manifest in a communal rather than agentic form in collectivistic countries (Gebauer, Sedikides, Verplanken, & Maio, 2012). Secondly, social media usage has been shown to differ between collectivistic and individualistic cultures. For example, United States samples have been found to differ from Asian samples (e.g., Korean, Taiwanese, and Chinese) on the number of friends listed (Alhabash, Park, Kononova, Chiang, & Wise, 2012), topics discussed (Fong & Burton, 2008), and motivations reported (Kim, Sohn, & Choi, 2011) for using social media. In addition, Long and Zhang (2014) found independent self-construal (which is prevalent in individualistic cultures; Markus & Kitayama, 1991) to relate to differences between British (individualistic) and Japanese samples in motivations for social media use. Thirdly, structural and political differences across

countries such as technological advancement, access to the internet, wealth, and censorship and/or control of internet content can also produce differences in media usage across countries (see Bolton et al., 2013 for a review).

Platform. Although many studies focus on social media use as a whole, meaningful differences have been found between platforms. The vast majority of studies in this review used Facebook for data collection. However, Facebook may differ from other sites in important ways. For example, Facebook is considered a nonymous (as opposed to anonymous) site because users are required to use their real names and subscribe to networks which are regionally or institutionally bound (Zhao, Grasmuck, & Martin, 2008), and Facebook censors content that is potentially offensive. Twitter provides slightly more anonymity, allowing users to post under a pseudonym or handle, while forums such as 4chan and Reddit make anonymity and freedom of content posting a priority. These differences may translate to differing relationships between narcissism and social media usage. For example, Facebook and Twitter have been found to differ in the facets of narcissism that drive use (Panek et al., 2013; Davenport et al., 2014). More specifically, college students high in the superiority facet preferred Twitter, whereas those high in exhibitionism preferred Facebook. However, adults (or Gen Xer's) high in superiority preferred Facebook.

The Present Research

Our goal in the present research is to estimate the association between narcissism (both grandiose and vulnerable) and social media use. We looked at four key markers of social media use, including: *time spent on social media*, *frequency of status updates*, *number of friends*, and *number of pictures of self and/or selfies uploaded*.

The outcome variables used in the present research, including network size, communication (e.g., photo sharing, status updates) and time spent online were examined for both practical and theoretical reasons. From a practical perspective, this work was a meta-analysis, so we were limited to outcome variables which were in the published literature and in sufficient numbers. The variables we studied were thus the ones that were available.

From a more theoretical perspective of social network sites activity, these variables also tap into important constructs in the literature. Research on social networks can come from two primary directions. In more formal/mathematical network analysis, variables like size, centrality, edges, structure, clustering, etc. are key to understanding the network (Eubank, Kumar, Marathe, Srinivasan,& Wang,2004, January; Kumar, Novak, & Tomkins,2010; Handcock, Raftery, & Tantrum,2007). In specific terms of social relationships in social networks, these can be divided into "similarities" (e.g., gender, group membership), "social relations" (e.g., friendships, likes), "interactions" (e.g.,helping, harming) and "flows" (e.g., information; Borgatti, Mehra, Brass & Labianca, 2009).

The work on social networks sites examined in the present research is more limited because it does not include statistical social network analysis of the social networks involved. Instead, it relies on individual level-data, typically individuals reporting their own experiences in social networks. Thus, the literature has developed to capture items important to network behaviors from an individual rather than network perspective. Along these lines, network size is crucial to how broad a network an individual has which is linked to social capital (e.g., Ellison, Steinfield, & Lampe, 2007). Communication such as sharing selfies and status updates is an important marker of information flow on networks. Time spent of the network is one measure of

engagement. Of course, there are other measures that could be used in research on social media. In our meta-analytic review we were limited to items that were used multiple times in the literature.

A second theoretical point is worth making. In the case of research examining narcissism, there is interest in variables that are theoretically linked to self-enhancement. On social network sites, these include breadth of network (breadth = a larger audience for self-promotion), image and photo sharing (again, in the interest of self-promotion) and time on the network (more time = more opportunity to self-promote; Buffardi & Campbell, 2008; McCain, et al. 2016). In sum, the variables chosen involve a practical consideration of what is in the literature, a theoretical consideration of what social network properties and activities are important, and an additional theoretical consideration of what social network properties and activities are plausible linked to narcissism.

In addition to the above indicators, we also looked at theoretically relevant moderators when possible, such as age, world region, and social media platform. We also test standard moderators such as gender, nature of the data (self-report vs. objective), type of sample (i.e., student, Mturk, or internet), and type of narcissism measure used. Given the evidence for potential moderators reviewed above we predict that a random effects model will best represent the data—that is, that the effect sizes are not sampled from a uniform distribution of effects. Our basic prediction is that grandiose narcissism will be positively associated with the spectrum of social media use with small to moderate effect sizes. We do not expect a similar effect for vulnerable narcissism although the literature is scarce so our prediction is not well justified. We do not have specific predictions for the various moderators.

Method

In order to quantify and test the link between narcissism and social media, we meta-analytically combined effect sizes from 62 samples from 29 papers (N = 13,430) for which effect size information for select indices was available. These studies are indicated in the reference section with an asterisk (*) and include 23 published works, four dissertations, one conference paper, and one set of unpublished data. Articles were searched on both the Google Scholar and EBSCO PsychINFO databases using the search terms "narcissism," "social media," and "Facebook." Any articles published before or during 2015 with reported effect sizes for the relevant indices were retained. In addition, unpublished data were solicited via a post on the Society for Personality and Social Psychology (SPSP) forums. Unpublished datasets were obtained either through this posting or through word of mouth. The large majority of these studies focused exclusively on grandiose narcissism and Facebook. Thus, the present paper speaks most strongly toward the relationship between grandiose narcissism (as measured by the NPI) and Facebook use.

The use of unpublished data is an important topic of debate. On one hand, peer review limits null findings so using only peer reviewed data can artificially inflate findings (McAuley, Tugwell, & Moher, 2000). On the other hand, including non-peer-reviewed findings can potentially reduce quality. In the medical literature (we are not aware of a similar survey in the social sciences), the majority of meta-analysts appear to recommend including unpublished data when possible (e.g., Cook et al,, 1993). We chose to include unpublished work because obtaining accurate effect size estimates was of primary importance. The social sciences are riddled with inflated and even non-existent effects and we wanted mitigate this risk as much as possible (Nosek, Spies, & Motyl, 2012).

We examined four outcome measures (i.e., time spent on social media, frequency of status updates, number of friends, number of pictures of self and/or selfies uploaded), each of which was measured by at least 10 studies. We also tested for moderation when possible. The majority of the samples measured grandiose narcissism using some version of the Narcissistic Personality Inventory (NPI), with 33% using the 40-item version (Raskin & Terry, 1988), 35% using the NPI-16 (Ames, Rose, & Anderson, 2006), and 2 studies using the NPI-13 (Gentile et al., 2013), and two using 15-item versions (i.e., Qiu, Lin, & Leung, 2010; Schütz, Marcus, & Sellin, 2004). Although three of these measures (excluding the NPI-15) have been shown to provide generally equivalent measurement of narcissism (Gentile et al., 2013), differences in the reliability of scores produced by these measures may add to the inconsistency of the relationship between narcissism and social media use. One study used the NARQ (Back et al., 2013) in lieu of the NPI to measure grandiose narcissism. In addition, two studies measured narcissism as part of the Dark Triad (i.e., the trio of "dark" personality traits identified by researchers: narcissism, psychopathy, and Machiavellianism; Paulhus & Williams, 2002), one using the Short Dark Triad (a short measure of the Dark Triad; Jones & Paulhus, 2014) and one using the Dirty Dozen (A twelve-item measure of the Dark Triad; Jonason & Webster, 2010). Although Dark Triad narcissism is usually conceptualized as grandiose narcissism (Paulhus & Williams, 2002), measuring narcissism in the context of the Dark Triad may also result in differing relationships between narcissism and social media use. Finally, Ong et al. (2011) used the revised Narcissistic Personality Questionnaire for Children (NPQC-R; Ang & Raine, 2009) for a sample of adolescents that may differ slightly in their measurement of narcissism. Vulnerable narcissism in this review was measured mostly with the Hypersensitive Narcissism Scale (HSNS; Hendin & Cheek, 1997), although Brailovskaia and Bierhoff (2016) used the revised Narcissistic Inventory

(NI-R; Neumann & Bierhoff, 2004) and Barry and colleagues (2015) used the Pathological

Narcissism Inventory (PNI; Pincus et al., 2009). We report the results for grandiose and

vulnerable narcissism separately.

All relationships were reported in or converted to Pearson's *r* correlation coefficients

which was used as our effect size statistic. All meta-analyses were conducted using the metafor

package (Viechtbauer, 2010) in R statistical software (R Core Team, 2014).

Social Media Measures

Time Spent on Social Media. Eighteen samples measured time spent on social media.

This was usually in the form of self-reported hours spent per day browsing, posting, and reading

content. This is separate from self-reported number of logins per day, which we did not include

in this analysis.

Frequency of Status Updates. Twenty-four samples measured frequency of status

updates. This was usually in the form of self-reported number of times one typically updates

their status in a given period of time. For the majority of studies this refers specifically to

Facebook status updates, although for two studies focusing on Twitter, this index refers to

frequency of "tweeting."

Number of Friends or Followers. Twenty-eight samples measured number of friends on

social media. This was usually in the form of self-reported number of friends, although three

samples retrieved objective friend counts from participants' social media profiles.

Pictures of Self/Selfies Uploaded. Eleven samples measured the frequency with which participants uploaded pictures of themselves including selfies to social media. Usually this was in the form of the self-reported number of pictures typically posted in a period of time. Because only three studies focused specifically on selfies, we did not differentiate between these and pictures of oneself in general.

Moderators

Average Age. The average ages of samples in this study ranged from 14 to 35. As discussed above, important differences could exist between ages and these could reflect generational or developmental effects.

World Region. The majority (67%) of samples in this meta-analysis came from Western (i.e., United States or Canada samples), whereas eight (17%) came from Europe, three (7%) came from Asia (i.e., China and Japan), two came from Russia, and one (2%) came from Australia. As seen in our review above, both structural and cultural differences across countries can and have been linked to both narcissism and social media use. Given the above research, it is feasible that the relationship between narcissism and social media usage may differ based on world region.

Social Media Platform. The majority of samples in this analysis focused exclusively on Facebook (65%), although six samples (13%) focused on Twitter, six (11%) on Instagram, and four (9%) surveyed participants about social media websites in general. This tendency to generalize from Facebook to other social media sites is potentially misleading, as platforms differ in important ways that may affect narcissism (see review above). In addition to testing platform as a moderator in this study, we caution against generalizing the results of this meta-analysis to social media sites other than Facebook and Twitter.

Percentage of Males in Sample. The gender diversity of the samples in this study

ranged from 35% male to 100% male. Although rarely studied with regards to social media,

gender differences in narcissism have been well documented (Grijalva, et al., 2014). More

specifically, men tend to be more narcissistic than women. According to Grijalva and colleagues,

narcissism is more consistent with the male gender role, and may be transmitted to each

generation of men through observation and culture, consistent with the biosocial model (Wood &

Eagly, 2012) of gender.

Type of Data. The vast majority (78%) of samples in this review were based on self-

report (e.g., participants were asked about their social media usage), while the remainder

included an objective source for their data (i.e., the participants' actual social media profiles).

Although Burke and colleagues (2010) found self-reports of such indices as number of friends

and hours of use to be equivalent to objective reports, the widespread use of self-report still

brings the possibility of biased reporting or common method variance (Podsakoff, 1986),

especially since narcissism was also universally measured via self-report. Testing for data type as

a moderator can indicate whether this reliance on self-report is problematic in social media

research.

Type of Sample. Roughly 59% of the samples used undergraduate student samples,

whereas 17% used Amazon MTurk, 7% used adolescent samples collected from high schools,

and the remainder recruited random samples online. Although several studies suggest that

MTurk samples do not appreciably differ from conventional samples or student samples in terms

of demographic diversity or quality of data produced (Buhrmester, Kwang, & Gosling, 2011;

Casler, Bickel, & Hackett, 2013), MTurkers are already self-selected in that they already have

access to the web and are engaged in some sort of internet activity. On the other hand,

undergraduate samples have classically been criticized as having WEIRD (White Educated Industrialized Rich and Democratic; Henrich, Heine, & Norenzayan, 2010) participants, especially in the United States. This is similar to the YAVIS (Young Attractive Verbal Intelligent and Successful; Jennings & Davis, 1977) criticism of individuals most likely to take part in clinical studies, and it implies that these two types of sampling have the potential to produce differing outcomes.

Results

Results of the meta-analysis can be seen in Table 1. Q-tests for heterogeneity were significant for all tests excluding that of vulnerable narcissism and selfie-taking. Forest plots for each index can be seen in Figures 3-6. Specific relationships between narcissism and social media use as well as moderators are discussed below.

Primary Associations

Grandiose narcissism was positively related to time spent on social media ($r = .11$), frequency of status updates ($r = .18$), number of friends ($r = .20$) and number of selfies ($r = .14$), although moderation analyses suggest the majority of these findings is qualified (there were no moderators tested that explained the variability in the relationship between grandiose narcissism and time spent on social media). We found no statistically significant effect for vulnerable narcissism.

Moderation Analyses

Grandiose narcissism was most strongly related to status updates in internet samples ($r = .66$), followed by MTurk ($r = .16$) and undergraduate ($r = .12$) samples, but was unrelated in adolescent ($r = .11$) samples, ($Q_M = 128.55$, $df = 3$, $p < .0001$). This relationship was also

Table 1. Meta-analytic results for all four indices for grandiose and vulnerable narcissism.

	Number of Samples (k)	Number of Participants (N)	Effect Size (*r*)	95% CI	P-value	SE of P	Z	Q	DF	P	Tau^2
Grandiose											
Time Spent	18	6132	0.11	[.04,.18]	0.001	0.03	3.23	96.33	17	<.0001	0.017
Frequency of Status Updates	21	7371	0.18	[.11,.26]	<.0001	0.04	4.67	113.6	19	<.0001	0.029
Friends/Followers	24	10079	0.20	[.14,.26]	<.0001	0.03	6.49	156.94	23	<.0001	0.019
Selfies	8	3853	0.14	[.06,.21]	<.0001	0.04	3.60	50.31	11	<.0001	0.009
Vulnerable											
Time Spent	0	-	-	-	-	-	-	-	-	-	-
Frequency of Status Updates	3	575	0.42	[-.01,.85]	0.06	0.22	1.91	97.52	2	<.0001	0.14
Friends/Followers	4	1033	0.21	[-.06,.49]	0.12	0.14	1.53	53.09	3	<.0001	0.073
Selfies	3	967	0.05	[-.02,.11]	0.16	0.03	1.40	1.17	2	0.56	0.003

Author(s) and Year	Estimate and 95% CI
Bergman et al., 2011	0.06 [-0.04 , 0.16]
Mehdizedah, 2010	0.61 [0.49 , 0.73]
Panek, Nardis, & Konrath, 2013 (1 FB)	0.06 [-0.03 , 0.15]
Panek, Nardis, & Konrath, 2013 (1 Twitter)	0.08 [-0.01 , 0.17]
Poona & Leung, 2011	0.17 [0.07 , 0.27]
Skues, Williams, & Wise, 2012	-0.09 [-0.19 , 0.01]
Schwartz, 2010	0.05 [-0.08 , 0.18]
Horton et al., 2014 (1)	0.19 [-0.01 , 0.39]
Horton et al., 2014 (2)	0.18 [0.05 , 0.31]
Garcia & Sikstrom, 2014	0.04 [-0.07 , 0.15]
Pettijohn et al., 2012	0.09 [-0.05 , 0.23]
Fox & Rooney, 2015	0.19 [0.12 , 0.26]
Weiser, 2015	0.12 [0.06 , 0.18]
Walters & Horton, 2015	-0.03 [-0.25 , 0.19]
Chen, 2014	0.06 [-0.08 , 0.20]
Lee et al., 2014	0.09 [-0.04 , 0.21]
Kojouri, 2015	0.03 [-0.10 , 0.16]
Weiss, 2013	0.06 [-0.09 , 0.21]
RE Model for All Studies	0.11 [0.04 , 0.18]

-0.40   -0.20   0.00   0.20   0.40   0.60   0.80

Time Spent

Figure 3. Forest plot of grandiose narcissism and time spent on social media.

substantially stronger for samples from Russia ($r = .73$) than for samples from Asia ($r = .20$), Europe ($r = .25$), or the United States ($r = .12$), $Q_M = 30.12$, $df = 5$, $p < .0001$. Finally, the NPI-40 detected the strongest relationship between grandiose narcissism and status updates ($r = .24$),

Author(s) and Year	Estimate and 95% CI

Vulnerable

Brailovskaia & Bierhoff,2015 (2b)	0.71 [0.59 , 0.83]
Brailovskaia & Bierhoff,2015 (2a)	0.56 [0.44 , 0.68]
Huling,2011 (V)	-0.01 [-0.11 , 0.09]
RE Model for Subgroup	*0.42 [-0.01 , 0.85]*

Grandiose

Weiss,2013	0.06 [-0.09 , 0.21]
Kojouri,2015	0.02 [-0.11 , 0.15]
Lee et al. ,2014	0.21 [0.09 , 0.33]
Brailovskaia & Bierhoff,2015 (1b)	0.73 [0.62 , 0.84]
Brailovskaia & Bierhoff,2015 (1a)	0.60 [0.49 , 0.71]
Weiser,2015	0.18 [0.13 , 0.23]
Deters, Mehl, & Eid ,2014	0.10 [-0.03 , 0.23]
Winter et al. ,2014	0.26 [0.12 , 0.40]
Garcia & Sikstrom,2014	0.04 [-0.07 , 0.15]
Seto,2012	0.17 [0.03 , 0.31]
Huling,2011 (G)	0.00 [-0.10 , 0.10]
Schwartz,2010	0.06 [-0.07 , 0.19]
Panek, Nardis, & Konrath,2013 (2)	0.27 [0.08 , 0.46]
Panek, Nardis, & Konrath,2013 (1)	0.09 [0.00 , 0.18]
Ong et al.,2011	0.19 [0.08 , 0.30]
McKenney, Kelly, & Duran,2012	0.26 [0.14 , 0.38]
Davenport et al.,2014 (2 Twitter)	0.18 [0.11 , 0.25]
Davenport et al.,2014 (2 Facebook)	0.15 [0.08 , 0.22]
Davenport et al.,2014 (1 Twitter)	0.18 [0.10 , 0.26]
Davenport et al.,2014 (1 Facebook)	0.07 [-0.02 , 0.16]
Bergman et al. ,2011	0.06 [-0.04 , 0.16]
RE Model for Subgroup	*0.18 [0.11 , 0.26]*

RE Model for All Studies	0.21 [0.13 , 0.30]

-3.00   -1.39   0.00   1.39

Status Updates

Figure 4. Forest plot of grandiose and vulnerable narcissism and frequency of status updates.
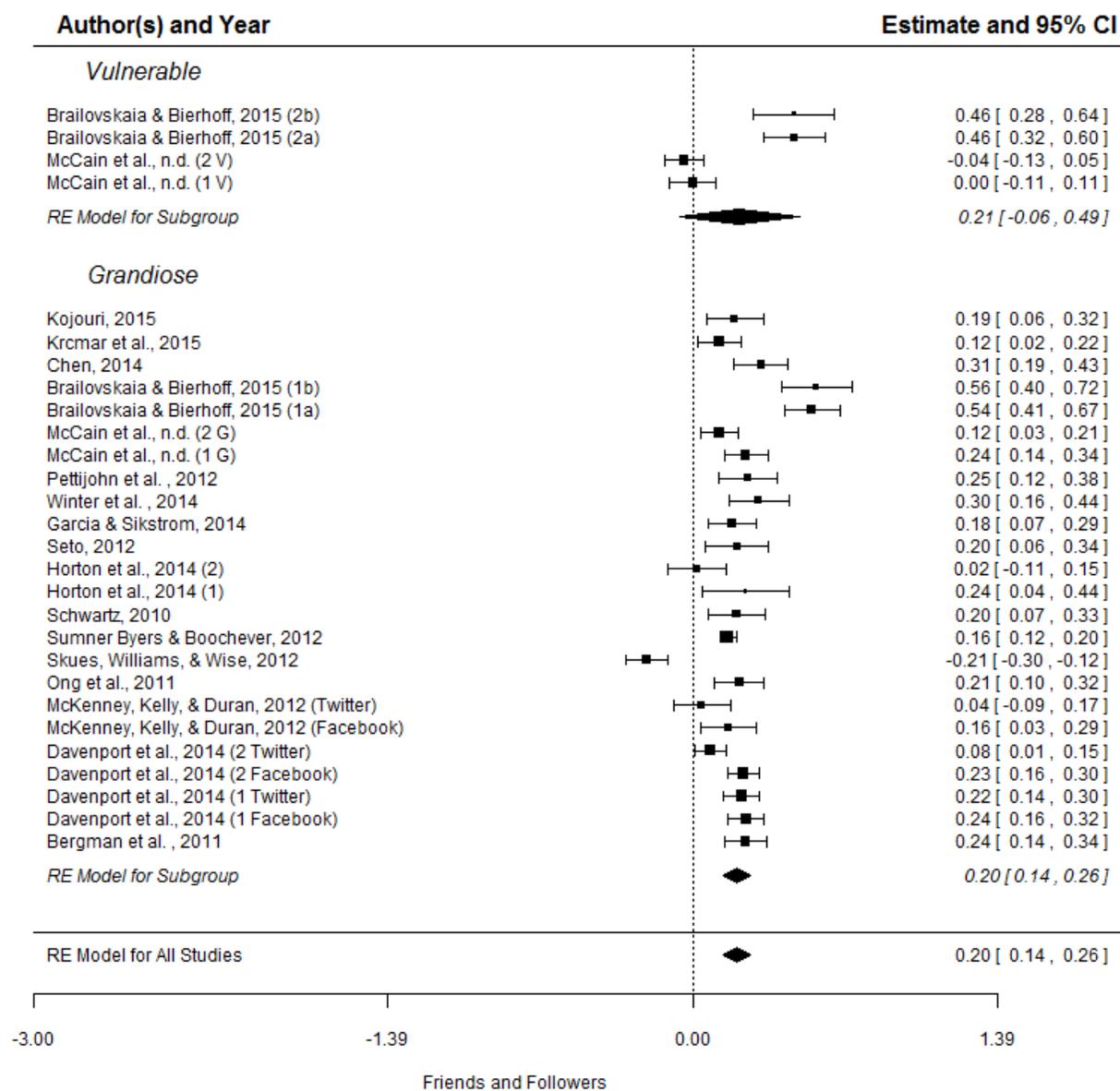
Figure 5. Forest plot of grandiose and vulnerable narcissism and number of friends on social media.
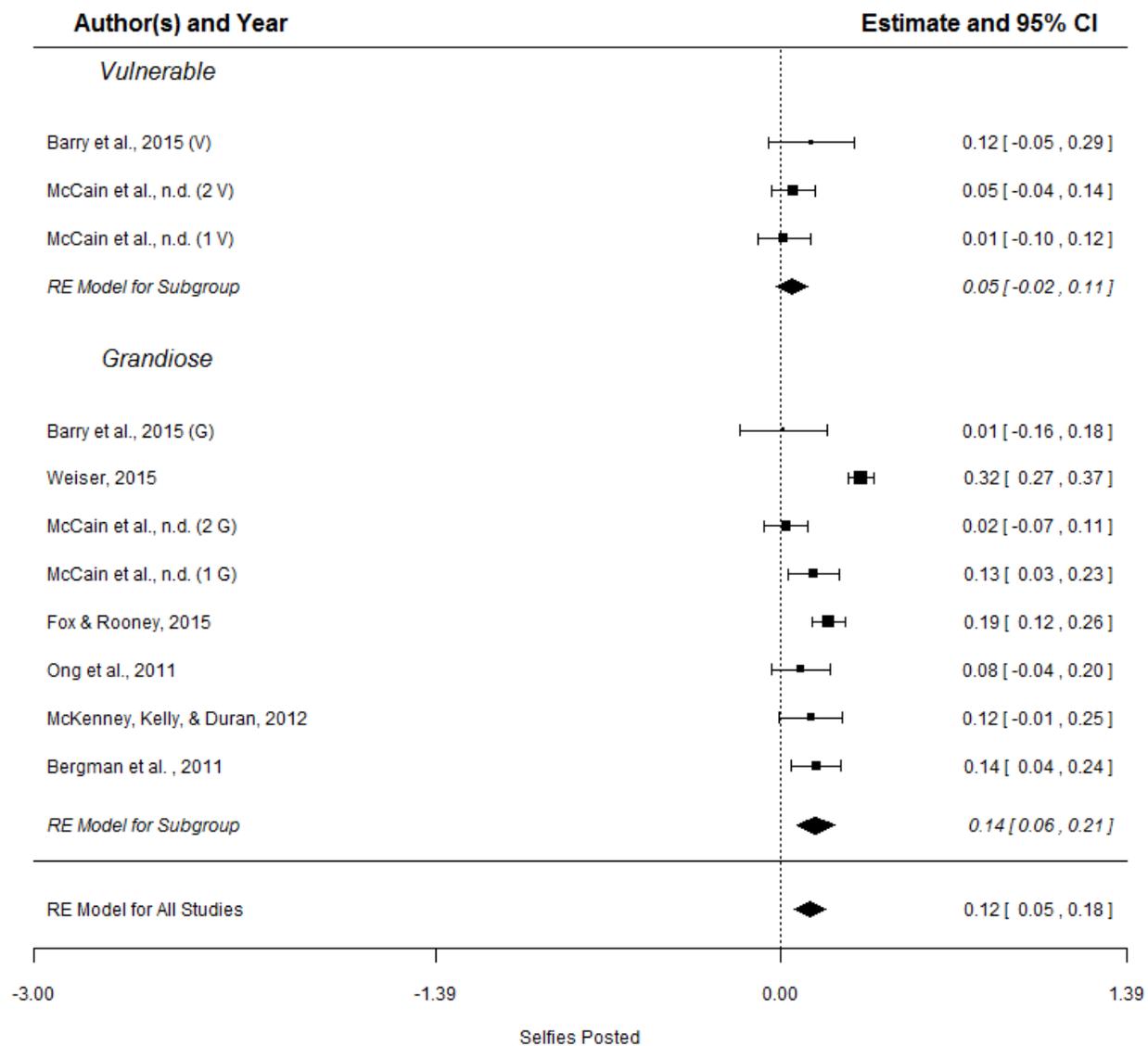
Figure 6. Forest plot of grandiose and vulnerable narcissism and selfies posted on social media.

followed by the NARQ ($r =.21$), the NPQCR ($r = .19$), the German translation of the NPI ($r = .10$), and the NPI-16 ($r = .08$), $Q_M = 15.87$, $df = 6$, $p < .05$. Grandiose narcissism was positively related to number of friends, although moderation analyses ($Q_M = 30.12$, $df = 5$, $p < .0001$) suggest that Russian samples ($r = 56$) significantly differed in this relationship from US ($r = .19$), Asian ($r = .21$), and European ($r = .29$) and that internet samples ($r = .38$) differed significantly from undergraduate ($r = .15$), MTurk ($r = .18$), and adolescent ($r = .17$) samples, $Q_M = 15.54$, $df = 3$, $p < .01$.

Finally, grandiose narcissism was positively related to posting pictures of oneself on social media although moderation analyses ($Q_M = 12.67$, $df = 2$, $p < .05$) suggest that this relationship may be nonsignificant for Instagram ($r = .06$), and stronger for studies that measured social media use broadly ($r = .22$) than for those focusing specifically on Facebook ($r = .10$). Because of the small sample size, we were unable to examine moderators for vulnerable narcissism.

Assessing Publication Bias and P-hacking

P-Curve Analyses. P-hacking, or the selective publication of statistically significant results while suppressing null findings, is a significant problem in contemporary social psychology. In light of this fact, we conducted P-curve analyses (Simonsohn, Nelson, & Simmons, 2014) on the four meta-analyses concerning grandiose narcissism to confirm that the above findings have evidential value and are not a result of p-hacking or publication bias. These analyses were conducted in R using syntax from www.p-curve.com. P-curves for all four indices

Table 2. P-curve significance values for all four indices of social media usage.

Index	Right Skew	Flatter than 33%	Left Skew
Time Spent	$p < .0001$	$p = 1.00$	$p = 1.00$
Frequency of Status Updates	$p < .0001$	$p = .98$	$p = .99$
Friends/Followers	$p < .0001$	$p = 1.00$	$p = 1.00$
Selfies	$p < .0001$	$p = 1.00$	$p = 1.00$

can be seen in Figure 5, whereas the relevant statistics for each p-curve can be found in Table 2. All four showed a shape that is right skewed and not flatter than 33%, suggesting that the data for all four indices have evidential value and that p-hacking is unlikely to have occurred.

Funnel Plots. Also to detect bias introduced by selective publication and heterogeneity, funnel plots (Egger, Smith, Schneider, Minder, & Berne, 2012) were generated for all four indices as related to grandiose narcissism (see Figure 8). Although all four showed considerable horizontal scatter, this is consistent with heterogeneity (Sterne et al., 2011) and consistent with world region as a moderator. In particular, certain studies taking place in Russia and Europe (i.e., Brailovskaia & Bierhoff, 2016, Samples 1 and 2), and Australia (Skues et al., 2012) fell outside of the funnel on all indices except selfies posted. Status updates showed heterogeneity from an unknown source, as a considerable number of studies with lower standard error had lower effect sizes than predicted. Only the plot for selfies shows the potential effects of reporting bias; however, given the small number of studies and the fact that selfie research is still in its early stages, we interpret this plot with caution.
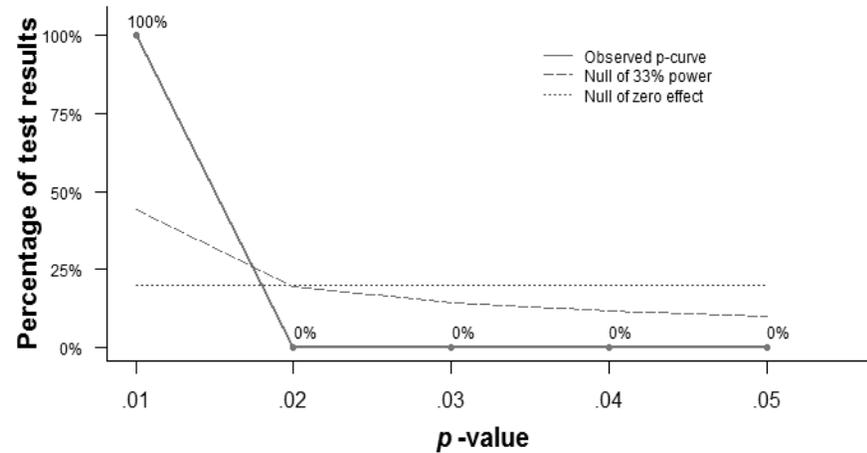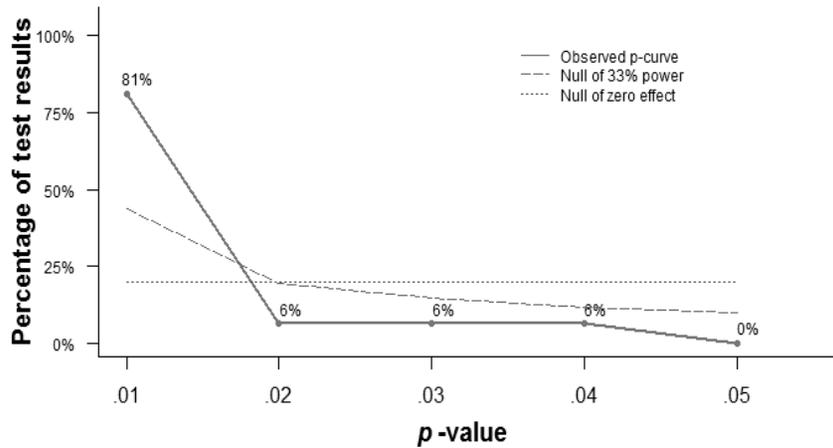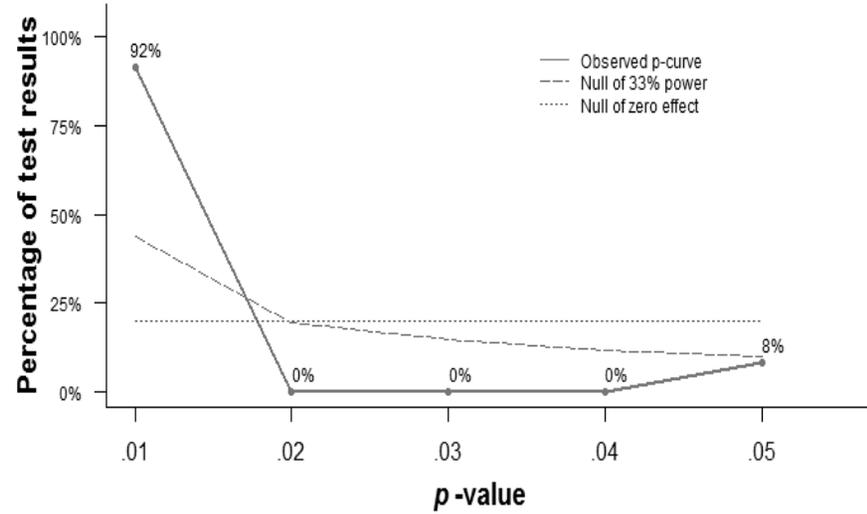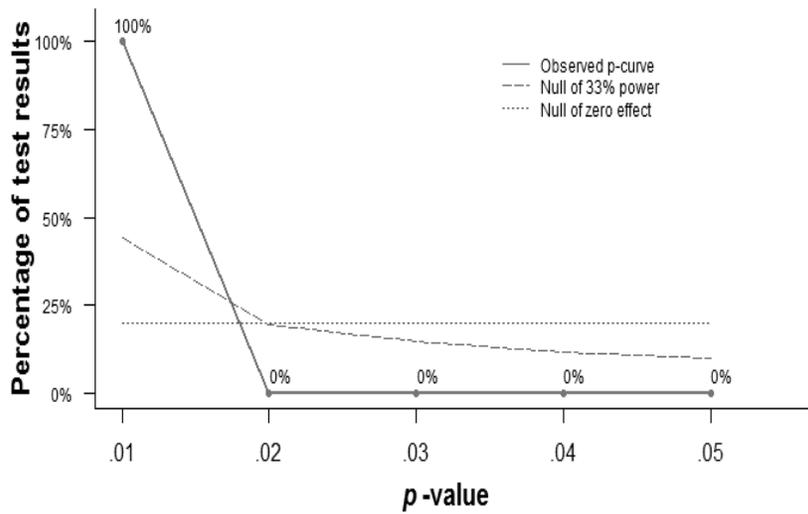
Figure 7. P-curves for meta-analyses of time spent on social media (top left), frequency of status updates (top right), friends/followers on social media (bottom left), and frequency of posting pictures of self (bottom right).

Discussion

Based on a sample of over 12,000 participants, meta-analytic results revealed a small to moderate positive association between grandiose (but not necessarily vulnerable) narcissism and social media use. This effect, however, differed somewhat depending on the aspect of social media use measured and the level of certain moderating variables.

Specific Findings

Grandiose narcissism appears to positively relate to time spent on social media websites. This effect is small, which may explain why it has not been found consistently throughout the literature. Although this relationship tested significant for heterogeneity, none of our proposed moderators could explain the data. Although narcissism appears to relate to time spent on social media in our sample of mostly Facebook-based, Millennial, and United States studies, given the differences seen in social media use across cohorts (Bergman et al., 2011; Leung, 2013; Panek et al., 2013) and cultures (Alhabash et al., 2012; Brailovskaia & Bierhoff, 2016; Kim et al., 2011; Long & Zhang, 2014; Markus & Kitayama, 1991), more diverse research is required to confirm its robustness across contexts.

Our meta-analysis also supports past findings on how narcissists use social media. Individuals high in grandiose narcissism appear to have more friends, post more frequent status updates, and post more pictures of themselves on social media than do non-narcissists. However, two of these relationships—between narcissism and number of friends and frequency of status updates—appear to be moderated by culture in that they are significantly higher in Russian samples. Asian samples failed to differ significantly from United States or European samples, which is inconsistent with past research showing that Asian countries, which tend to have
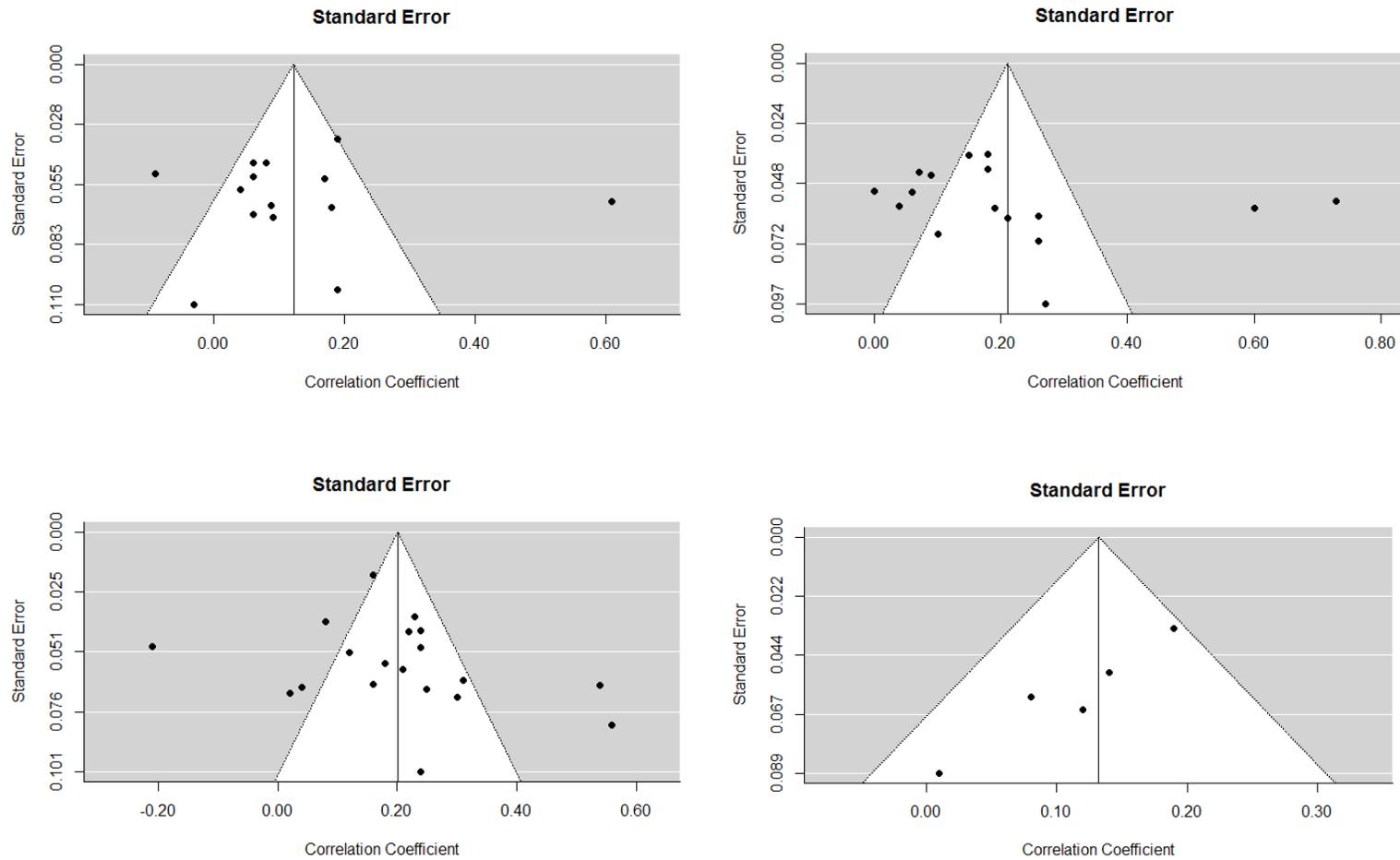
Figure 8. Funnel plots for meta-analyses of time spent on social media (top left), frequency of status updates (top right), friends/followers on social media (bottom left), and frequency of posting pictures of self (bottom right).

collectivistic cultures (Hofstede, 1980) and interdependent self-construals (Markus & Kitayama, 1991), have differing relationships between narcissism and social media use. However, Russia is considered to have an attenuated collectivistic culture (Latova & Latov, 2009) that has both individualistic and collectivistic elements and which may have a unique effect on the relationship between narcissism and social media use. Given that little research is available on social media usage in Russia at this time, and the current findings are based on a single multi-study paper, we interpret this finding with caution.

The finding that individuals high in grandiose narcissism more frequently update their statuses also appears to be moderated by sample type. Specifically, the relationship was strongest for internet samples, which were not specific to any particular age group or location, and was nonsignificant for adolescent samples. MTurk samples showed only a slightly stronger relationship overall than did undergraduate samples, inconsistent with past findings that narcissism relates more strongly to social media usage in Generation Xers (e.g., Leung, 2013; Panek et al., 2013). The average age of the internet samples (M = 24.43) largely reflects a Millennial sample, and was not linked to any specific location or culture. However, this lack of contextual boundaries may leave these samples more vulnerable to self-selection than undergraduate, adolescent, or MTurk samples. It may be that individuals who have a stronger relationship between narcissism and status updates were more likely to sign up for these studies.

The finding that individuals high in grandiose narcissism post pictures of themselves more frequently on social media also appears to be moderated by platform. This finding was nonsignificant for Instagram only studies, but was stronger in studies that did not specify a platform. This makes any interpretation difficult.

Finally, vulnerable narcissism has yet to be studied in depth in relation to social media usage. In the few studies conducted to date, vulnerable narcissism appears to show no relationship to social media usage, with the possible exception of frequency of status updates. These results should be viewed very cautiously, however.

From a theoretical perspective, these results fit with both the self-enhancement and fit models on narcissism and social media. In terms of self-enhancement, each of the behaviors we examined (use, posting, selfies) were potentially routes to self-enhancement. That said, there was no consistent pattern of moderation that could be used to fully support this model. Likewise, in terms of fit, the number of friends in particular was a good marker of fit and it was reliably linked to grandiose narcissism. Again, however, there was no pattern of moderators that allowed us to fully embrace the fit model. Ideally, future research will use more detailed approaches that allow for a precise understanding of why narcissism is linked to social media use.

Limitations and Future Research

Like all meta-analyses, this one is limited by the existing data. Our findings regarding moderation are somewhat inconsistent with past research, which may be due to the inclusion of unpublished data in our analyses. However, the results of the p-curve analysis and funnel plots suggest that the data are not clearly biased in a systematic way. We hope future research continues this apparent willingness to publish null results so as to provide the best effect size estimates possible. There was a lack of findings involving hypersensitive narcissism. We would encourage researchers interested in narcissism and social media to include a hypersensitive narcissism scale in studies where there is an interest in narcissism. All the effect sizes in this meta-analysis were cross-sectional. There is a major need for experimental or longitudinal data in order to better illuminate the mechanisms by which narcissism affects, or is affected by, social

media behavior. Finally, eleven years after the advent of Facebook, the relationship between grandiose (NPI) narcissism and self-reported Facebook usage alone has been well established with at least 22 studies. Researchers should now focus their resources on studying this relationship in the variety of other social media platforms available (e.g., Instagram, Reddit, Tumblr, Snapchat) as well as examining vulnerable narcissism alongside grandiose narcissism. Comparing these relationships among different platforms will provide a better understanding of how the features of social media sites influence behavior. More attention should also be paid to cross-cultural work, as the present analysis shows that at least some differences in social media use between cultures exist. Finally, researchers should strive to use more objective measures (i.e., using metrics from actual social media profiles) rather than relying on self-reports to measure social media behavior.

Conclusion

As social media sites have blossomed so too has the interest in social media and narcissism. Still, this field of research is only seven years as measured from publication of the first paper (Buffardi & Campbell, 2008). We now have relatively robust evidence that grandiose narcissism is associated with social networking behavior across many – but not all – conditions. And we know the size of the association ranges from small to moderate. We will hopefully continue to see the expansion of this research into current and emerging social media platforms.

CHAPTER 3

PERSONALITY AND SELFIES: NARCISSISM AND THE DARK TRIAD

Introduction

Selfies, or pictures taken of oneself and shared on social media, have become a

worldwide phenomenon. There is an estimated one million selfies taken per day (Petrow, 2015)

and at least half of Millennials in the United States (US) have shared a selfie (Taylor, 2015).

Selfies have spawned their own economic ecology with items like special filters designed to

enhance or otherwise alter the taker's appearance and selfie sticks that allow the user to hold the

camera farther away and thus get a wider angle on the picture. Plastic surgeons have even

reported an increase in people seeking cosmetic procedures because they do not like how they

look in selfies or only like certain aspects of themselves in selfies (American Academy of Facial

Plastic and Reconstructive Surgery, 2015). Finally, there has been a worldwide discussion of

where, when, and how selfies are appropriate social behavior. For example, many cultural,

ecologically important historic sites are banning selfie sticks to prevent damage and accidents.

Likewise, there have been social sanctions against individuals taking selfies at funerals and at the

scenes of tragedies.

Researchers have begun to examine selfies in two ways: as manifestations of personality

and of self-regulation (Barry et al., 2015; Fox & Rooney, 2015; Qiu, Lu, Yang, Qu, & Zhu,

2015). From a personality perspective, selfies can be conceptualized as a reflection of

personality. For example, we might expect *grandiose narcissism* (the more extraverted,

charismatic and attention-seeking form of narcissism; Miller et al., 2011) to be associated with posting sexier selfies, more provocative content in selfies, and wearing more fashionable and stylish clothing and having a more "neat" appearance in selfies (Buffardi & Campbell, 2008; Vazire, Naumann, Rentfrow et al., 2008). *Vulnerable narcissism* (the more neurotic, insecure form) has not yet been found to have clear behavioral reflections.

The act of taking selfies can also be conceptualized as self-regulation; that is, a selfie can change an individual's emotions and beliefs in specific ways. For example, narcissism can be conceptualized as a self-reinforcing process in which traits such as self-promotion and social confidence elicit reactions from others that reinforce a grandiose self-concept, which leads to more self-promotion and social confidence (Campbell, Brunell, & Finkel, 2006). Similarly, narcissism can be conceptualized as a more intentional process in which individuals seek to buttress a grandiose self-concept using interpersonal and intrapersonal strategies (such as claiming credit for others' successes or self-serving attributional bias) that elicit feedback congruent with their self-views (Morf & Rhodewalt, 2001). Consistent with this self-regulation approach, taking selfies could be used to elicit immediate positive feedback that reinforces or protects a narcissist's grandiose self-view. Within this framework, differences in approach and avoidance motivation between grandiose and vulnerable narcissism would affect how selfies are used for self-regulation. Grandiose narcissists are primarily approach motivated and may be likely to engage in more selfie-taking and posting without concern for potential negative consequences (Campbell et al., 2006; Foster & Trimm, 2008). In contrast, vulnerable narcissists are high in both approach and avoidance motivation (Campbell et al., 2006; Foster & Trimm, 2008), and thus may be more likely to take selfies but also attempt to guard against potential rejection by staging, editing, filtering, or cropping their selfies.

The analysis of selfies has focused on two main areas: the number of selfies taken and the content of the selfies. For example, grandiose narcissism is related to self-reported number of selfies in large sample (Fox & Rooney, 2015, but cf. Barry et al., 2015). Likewise, in work on personality there is some evidence that individuals can estimate personality from selfies, but little evidence that there are specific markers of personality, at least as conceptualized by the Big Five, in selfies (Qiu et al., 2015).

In the present research, we will examine narcissism, both vulnerable and grandiose, and self-reported number of selfies. We will also try to assess issues of self-regulation by looking at the motives and emotions associated with selfie taking. Finally, we try to go beyond self-report data by looking at content analyses of selfies as well as outside observer ratings and self-reported use of other social networking sites. Consistent with past research, in addition to our primary measures of grandiose and vulnerable narcissism, we include an integrated measure of the dark triad of narcissism, psychopathy and Machiavellianism as well as a measure of self-esteem.

Based on past research on the manifestations of personality on social networking and in photographs we would expect that personality traits in general, and narcissism in particular, would plausibly be perceivable from selfies (Buffardi & Campbell, 2008; Gosling, Gaddis, & Vazire, 2007; Naumann, Vazire, Rentfrow, & Gosling, 2009; Vazire, Naumann, Rentfrow, & Gosling, 2008). Based on this literature, we would similarly predict that personality would be associated with certain markers in selfies (e.g., clothing) but given the Qiu and colleagues (2015) findings, these markers might be limited. Finally, theory and data on narcissism suggest that grandiose narcissism will be associated with self-enhancement in selfie taking, but vulnerable narcissism will be associated with more anxiety and self-protection. The dark triad traits in

general should be somewhat similar to grandiose narcissism (e.g., Fox & Rooney, 2015), with dark triad narcissism being a more grandiose form (Miller et al., 2010). Self-esteem is more challenging to predict, so we consider that exploratory.

Given concerns with false positives in psychological research and the risks of over-interpreting data, we will focus on broad patterns of findings in two relatively large samples rather than on single correlations. In Study 1, we focus on self-reported selfie taking using an online sample; in Study 2, we examine self-reported selfie taking to replicate the results of Study 1, but also use more objective data (e.g., selfie counts, observer ratings, content analyses). To aid in description and to make the replication across samples clear, we report the self-report data from Study 1 and Study 2 together, followed by the more objective data from Study 2.

<center>**Study 1 & 2: Self-report Data**</center>

Methods

  Participants and Procedure: Study 1. Via Amazon MTurk, 348 residents of the United States (Mean Age = 31.85; 49% female) completed measures of personality, demographics, and several questions about selfie behavior online. Of the resulting sample, 78% self-identified as white, 7% as African American, 4% as Asian, 1% as Native American, and 10% as mixed race. Participants signed up for the study of their own accord, and were compensated for their participation through MTurk.

  Participants and Procedure: Study 2. Four hundred and ninety one (Mean Age = 18.87 (SD = 1.29; 78.6% Female) undergraduate students from a large southeastern university participated in the study for course credit. Participants signed up for the study via a subject pool

and first completed the same series of measures as in Study 1. Then 199 of these participants came into the lab where they provided access to their Instagram and Iconosquare pages and took a selfie that they then sent to the lab email address (described in detail below).

Materials. Personality and selfie measures are described below. All personality measures are commonly used in the literature. The selfie scales are new or modified scales. Note: This data was collected as part of a larger study including the Big Five personality traits. Correlations with these traits can be found in the supplemental data.

Grandiose Narcissism. The 13-item *Narcissistic Personality Inventory* (NPI-13; Gentile et al., 2013) is a 13-item nonclinical measure of dimensional narcissism (Study 1 Cronbach α = .78; Study 2 α = .66). For each item, participants choose which of two statements (e.g., "I like to be the center of attention"/ "I prefer to blend in with the crowd") best describes them. Scores range from 0-13.

Vulnerable Narcissism. The *Hypersensitive Narcissism Scale* (HSNS; Hendin & Cheek, 2013) is a 10-item scale (Study 1 α = .76; Study 2 α = .73) designed to measure vulnerable narcissism. Items such as "my feelings are easily hurt by ridicule or the slighting remarks of others" are rated on a 5-point Likert-type scale.

Dark Triad. The *Short Dark Triad* (SD3; Jones & Paulhus, 2014) is a 27-item measure of the Dark Triad traits (i.e., narcissism, psychopathy, and Machiavellianism). Nine items are devoted to each trait; items such as "It's not wise to tell your secrets," (Machiavellianism; Study 1 α = .80; Study 2 α = .71) "People see me as a natural leader," (narcissism; Study 1 α = .81; Study 2 α = .61) and "I like to get revenge on authorities" (psychopathy; Study 1 α = .81; Study 2 α = .64) are endorsed by participants on a 5-point Likert-type scale.

Self-Esteem. The *Rosenberg Self-Esteem Scale* (RSES; Rosenberg, 1989) is a widely used 10-item measure (Study 1 α = .92; Study 2 α = .88) of explicit self-esteem. Items such as "on the whole, I am satisfied with myself" are rated on a scale from 1 to 5 with 1 signifying "*this statement does not describe me in the slightest*" and 5 signifying "*this statement describes me perfectly*."

Selfie Behavior. Participants responded to a series of questions about the selfie-taking process on 5-point Likert-type scales. These questions assessed a range of behaviors such as the frequency of selfie-taking, aspects of selfies taken (e.g., including just the face or the entire body), and preparation for taking and posting selfies (e.g., putting on makeup).

Selfie Posting Sites. Participants reported how often they posted selfies to Facebook, Twitter, Instagram, or other sites on a scale from 1 (*never*) to 5 (*all of the time*).

Selfie Context. Participants rated how likely they were to take a selfie in each of four times (i.e., on a weekday vs. weekend and during the day vs at night) as well as in each of eight places (i.e., home, work, class, a public business, entertainment venue, visiting someone, en route, or somewhere else; list taken from Sonnenberg, Riediger, Wrzus, & Wagner, 2012) on a 5-point Likert-type scale.

Selfie Emotions. To assess emotional responses to posting selfies, participants rated how often they felt a list of 13 emotions (see Carstensen et al., 2011) on a scale from 1 (*Never*) to 5 (*All of the time*) when posting a selfie, when someone likes their selfie, when someone comments on their selfie, and when someone does not like their selfie.

Selfie Motivations. To assess motivations for posting selfies, participants completed nine questions adapted from Seidman's (2013) study of motivations for Facebook behavior in addition to 28 questions from Smock and colleagues' (2011) study of the same. Questions

assessed a variety of motivations including belongingness (e.g., "How often do you post selfies to feel closer to others") and self-presentation (e.g., "How often do you post selfies to show off?") motivations and were rated on a 5 point scale with 1 signifying *Never* and 5 signifying *Very Often*.

Instagram Use. In order to assess the use of Instagram—a social media website often used to post selfies—participants responded to a range of questions adapted from Ross et al.'s (2009) study of Facebook use. Questions assessed whether participants had an Instagram account, time spent on Instagram, frequency of selfies posted, number of followers, number of others followed, number of likes typically received, and number of likes typically given to others' content. Five statements adapted from this study (i.e., "Instagram is a part of my everyday activity;" "I feel out of touch when I haven't logged into Instagram;" "I enjoy posting pictures on Instagram;" "I enjoy tagging pictures on Instagram;" "I am proud to post pictures on Instagram") were endorsed on a 5-point Likert-type scale and combined as a measure of "Instagram Engagement."

Results

Selfie Behavior. As seen in Table 3, NPI narcissism is correlated positively with selfies taken per day and selfies taken as an individual and negatively correlated with selfies taken with others. The dark triad traits are also positively correlated with selfies per day. The dark triad and vulnerable narcissism correlate with selfies of "just you" or individual selfies. Beyond these findings there are few associations that replicate across samples.

Selfie Posting Sites. As seen in Table 4, The most consistent patterns of selfie posting to various sites are grandiose narcissism (NPI and dark triad) and psychopathy to Twitter, and grandiose narcissism (dark triad and NPI in one group) to Instagram.

Table 3. Correlations between personality and selfie behaviors in Studies 1 and 2. Note: NPI=Grandiose Narcissism;

HSNS=Vulnerable Narcissism; DT-M=Dark Triad Machiavellianism; DT-N=Dark Triad Narcissism; DT-P=Dark Triad Psychopathy;

SE=Self-esteem. 95% CI's available in supplemental data. * indicates significant correlations, *p*<.05.

	Per day	At a Time	Days With Out	Take yourself	Just you	Back Camera	Just Face	Makeup	Brighten	Shade	filter	Crop
						Study 1						
NPI	.25*	.00	-.23*	-.01	.21*	-.03	-.25*	.00	.07	.10	.11	.03
HSNS	.01	.03	.00	.06	.21*	-.01	-.05	.06	.10	.04	.07	.10
DT-M	.13*	.00	-.06	.02	.15*	-.04	-.09	-.04	.04	.01	.05	.03
DT-N	.20*	.02	-.18*	-.06	.19*	-.01	-.20*	-.05	.12*	.11*	.08	.04
DT-P	.19*	-.08	-.18*	-.02	.18*	-.02	-.22*	-.16*	-.01	.10	.04	.04
SE	.05	.10	-.08	.07	.01	-.05	.06	-.01	.15*	-.02	.10	.05
						Study 2						
NPI	.15*	.14*	-.07	.05	.18*	.00	-.10*	.03	.08	-.05	.06	.03
HSNS	.08	.21*	-.05	.08	.14*	.02	-.05	.09	.08	.05	.12*	.12*
DT-M	.11*	.22*	-.13*	.11*	.19*	.03	-.08	-.01	.01	-.06	.04	.01
DT-N	.18*	.12*	-.14*	.05	.12*	.03	-.07	-.11*	-.02	-.14*	.03	-.02
DT-P	.12*	.10*	-.12*	.14*	.21*	.04	-.09	-.18*	-.09	-.01	-.04	-.05
SE	.03	-.12*	-.02	-.07	-.10*	.01	.03	-.04	-.02	-.11*	-.09	-.07

Table 4. Correlations between personality and social media sites used for selfies in Studies 1 and 2. Note: NPI=Grandiose Narcissism; HSNS=Vulnerable Narcissism; DT-M=Dark Triad Machiavellianism; DT-N=Dark Triad Narcissism; DT-P=Dark Triad Psychopathy; SE=Self-esteem. 95% CI's available in supplemental data. * indicates significant correlations, *p*<.05.

	Facebook	Twitter	Instagram	Other site
Study 1				
NPI	.08	.26*	.26*	.14*
HSNS	-.03	-.01	.01	.04
DT-M	.02	.08	.11	.07
DT-N	.14*	.23*	.17*	.10
DT-P	.05	.17	.15*	.12
SE	.12*	.01	.12*	-.03
Study 2				
NPI	.05	.15*	.09	.09
HSNS	.10*	.05	.13*	.05
DT-M	.03	.10*	.12*	.03
DT-N	.05	.18*	.10*	.10*
DT-P	-.01	.12*	.05	.05
SE	-.08	.00	-.06	-.04

Table 5. Factor analysis of self-reported selfie behaviors at different times and places.

	Factor		
	Social	Workday	Freetime
Entertainment Venue	**.834**	.522	.361
Weekend Night	**.700**	.379	.495
Visiting someone	**.681**	.367	.347
Somewhere Else	**.655**	.528	.524
Work	.434	**.741**	.459
Public Business	.541	**.735**	.479
Class	.349	**.717**	.312
En Route	.466	**.548**	.470
Weekday Day	.262	.517	**.681**
Weekday Night	.555	.558	**.677**
Weekend Day	.496	.353	**.592**
Home	.275	.211	**.551**

Factor Analyses and Data Reduction. Because of the large number of selfie questions in this study, for the remaining variables we used a series of factor analyses to reduce the data into underlying factors. This approach also reduces familywise error. All factor analyses were conducted in SPSS using principal axis factoring with a promax rotation. (Note: Full correlation matrices are reported in supplemental materials).

Selfie Context. A factor analysis (see Table 5) on the selfie behavior questions pertaining to time and place revealed three factors corresponding to social settings (e.g., "entertainment venue," "visiting someone," "at night on the weekends"), daytime settings (e.g., "work," "class," "at a place of business"), and during leisure time (e.g., "during the day on the weekend," "at home"). Thus we created three context subscales: *Social*, *Workday*, and *Freetime*.Results showed consistently across samples that workday selfies were associated with Machiavellianism (Samples 1 and 2 r = .14, 95% CI [.04,.25]), dark triad narcissism (Sample 1 r[349] = .29, 95% CI [.19,.38] ; Sample 2 r[491] = .25, 95% CI [.14,.34]), psychopathy (Sample 1 r[349] = .30, 95% CI [.03,.23]; Sample 2 r[491] = .19, 95% CI [.09,.29]), and NPI narcissism (Sample 1 r[349] = .23, 95% CI [.13,.32]; Sample 2 r[491] = .15, 95% CI [.05,.25]); social selfies were associated with dark triad narcissism (Sample 1 r[349] = .23, 95% CI [.12,.32]; Sample 2 r[491] = .13, 95% CI [.02,.23]); and freetime selfies were associated with dark triad narcissism (Sample 1 r[349] = .17, 95% CI [.06,.27]; Sample 2 r[491] = .21, 95% CI [.11,.31]).

Selfie Emotions. A factor analysis (see Table 6) of the emotion questions revealed two factors corresponding to *negative affect* and *positive affect*. Thus, for each situation, guilt, shame, disgust, sadness, embarrassment, anxiety, frustration, and anger were combined to form the negative affect subscale, while excitement, happiness, interest, and pride were combined to form the positive affect subscale. The item boredom was analyzed separately, as it did not load strongly on either factor.

Overall, the clearest findings were that NPI and dark triad narcissism were associated with positive emotions across all experiences except being disliked, and psychopathy was associated with negative emotions across all experiences (see Table 7).

Table 6. Factor analysis of self-reported emotions during selfie-taking.

	Factor	
	Negative	Positive
Guilt	**.846**	.089
Shame	**.825**	-.098
Disgust	**.805**	-.020
Sadness	**.796**	.065
Embarrassment	**.667**	-.129
Anxiety	**.656**	-.021
Frustration	**.654**	-.024
Anger	**.632**	.111
Boredom	.221	.118
Excitement	.016	**.881**
Happiness	-.042	**.845**
Interest	.012	**.827**
Pride	.054	**.790**

Selfie Motivations. A factor analysis (see supplemental data) on the motivation questions revealed nine factors containing questions that correspond to sharing information (e.g., "to provide information about a special interest of mine," "to keep in touch with friends and family"), escapism/avoiding loneliness (e.g., "to get away from the rest of my family or others," "so I don't have to be alone"), boredom (e.g., "because it passes the time away, particularly when I'm bored"), self-presentation (e.g., "to show off"), leisure/entertainment (e.g., "because it relaxes me"), intimacy/belongingness (e.g., "to feel close to others"), social conformity (e.g., "because it's cool," "because everyone else is doing it"), professional reasons (e.g., "to help me network with professional contacts") and entertaining others (e.g., "to make a joke/be funny"). Therefore, we computed nine subscales: *Informing*, *Escapism*, *Boredom*, *Self-Presentation*, *Leisure*, *Belongingness*, *Conformity*, *Professional*, and *Perform*.

Table 7. Correlations between personality and emotions endorsed during the selfie process in Studies 1 and 2. Note: NPI=Grandiose Narcissism; HSNS=Vulnerable Narcissism; DT-M=Dark Triad Machiavellianism; DT-N=Dark Triad Narcissism; DT-P=Dark Triad Psychopathy; SE=Self-esteem. 95% CI's available in supplemental data. * indicates significant correlations, *p*<.05.

	Positive				Negative				Boredom			
	Post	Like	Comment	Dislike	Post	Like	Comment	Dislike	Post	Like	Comment	Dislike
Study 1												
NPI	.23*	.21*	.18*	.23*	-.01	.02	.03	.00	.02	.02	.09	.11
HSNS	-.02	.13*	.07	.05	.29*	.23*	.22*	.29*	.12*	.08	.09	.04
DT-M	.02	.08	.06	.07	.10	.03	.04	.14*	.10	.05	.04	.15*
DT-N	.32*	.24*	.21*	.26*	-.03	.00	.02	.04	.01	.06	.14*	.20*
DT-P	.06	.05	.00	.20*	.28*	.25*	.29*	.17*	.13	.16*	.25*	.20*
SE	.32*	.23*	.22*	.13*	-.43*	-.32*	-.30*	-.23*	-.17*	-.18*	-.19*	.01
Study 2												
NPI	.19*	.17*	.14*	.06	.08	.05	.05	.17*	.02	.04	.06	.06
HSNS	.19*	.26*	.24*	.06	.31*	.18*	.16*	.31*	.15	.03	.07	.11
DT-M	.18*	.16*	.14*	.02	.11*	.09	.10	.18*	.11	.00	.06	.05
DT-N	.25*	.15*	.13*	.07	-.07	.03	.02	.11*	-.03	.06	.10	.08
DT-P	.19*	.11*	.09	.20	.17*	.20*	.16*	.17*	.12	.19	.23	.14
SE	-.02	-.02	-.05	-.06	-.35*	-.19*	-.17*	-.22*	-.16	-.13	-.11	-.06

Dark triad narcissism, psychopathy and vulnerable narcissism were associated with belongingness. All variables except self-esteem were associated with self-presentation. Dark triad narcissism and psychopathy were associated with belonging. Dark triad narcissism was associated with informing. The full dark triad and vulnerable narcissism were associated with escapism and conformity. Dark triad narcissism and psychopathy were associated with professional, and the full dark triad was associated with boredom (see Table 8).

Table 8. Correlations between personality and motivations for taking selfies in Studies 1 and 2.

Note: NPI=Grandiose Narcissism; HSNS=Vulnerable Narcissism; DT-M=Dark Triad Machiavellianism; DT-N=Dark Triad Narcissism; DT-P=Dark Triad Psychopathy; SE=Self-esteem. 95% CI's available in supplemental data. * indicates significant correlations, *p*<.05.

	Belonging ness	Self Presentation	Perform	Leisure	Inform	Escapism	Conform	Profession	Boredom
				Study 1					
NPI	.09	.34*	.13*	.14*	.07	.14*	.15*	.09	.14*
HSNS	.17*	.23*	-.04	-.11	.04	.19*	.21*	.10	.09
DT-M	.07	.14*	.01	.02	.01	.14*	.17*	.07	.19*
DT-N	.16*	.35*	.21*	.30*	.26*	.21*	.20*	.16*	.14*
DT-P	.11*	.31*	.11*	.13*	.01	.30*	.25*	.21*	.18*
SE	.02	.01	.15*	.23*	.14*	-.02	.00	-.07	.06
				Study 2					
NPI	.04	.23*	-.01	.10	.01	.06	.07	.08	.04
HSNS	.27*	.36*	.07	.12*	.21*	.18*	.23*	.12*	.15*
DT-M	.16*	.26*	-.04	.15*	.14*	.15*	.13*	.14*	.20*
DT-N	.11*	.23*	.01	.22*	.13*	.14*	.12*	.16*	.12*
DT-P	.13*	.20*	.10	.15*	.15*	.20*	.14*	.23*	.17*
SE	-.15*	-.15*	-.04	.03	-.07	-.16*	-.15*	-.12*	-.07

Instagram Usage. In both samples NPI narcissism predicted the reported number of followers (Sample 1 *r*[349] = .24, 95% CI [.14,.34]; Sample 2 *r*[491] = .12, 95% CI [.03,.21]), number of likes (Sample 1 *r*[349] = .18, 95% CI [.07,.28]; Sample 2 *r*[491] = .10, 95% CI [.02,.19]), and overall participant engagement with Instagram (Sample 1 *r*[349] = .12, 95% CI [.01,.22]; Sample 2 *r*[491] = .10, 95% CI [.01,.19]). Dark Triad narcissism predicted reported selfies per day (Sample 1 *r*[349] = .15, 95% CI [.05,.25] Sample 2 *r*[491] = .13 [.04,.22]).

Profile Analyses. Profile analyses were used to compare patterns of relationships between the personality variables and aspects of selfie behavior, emotions, and motivations. This procedure entails using the full spectrum of correlations associated with each personality variable

Table 9. Profile analysis between personality and selfie behaviors. Study 1 (white region) region) and Study 2 (shaded region) in Study 1. Note: NPI=Grandiose Narcissism; HSNS=Vulnerable Narcissism; DT-M=Dark Triad Machiavellianism; DT-N=Dark Triad Narcissism; DT-P=Dark Triad Psychopathy; SE=Self-esteem. * $p < .05$, ** $p < .01$

	NPI	HSNS	DT-N	DT-M	DT-P	SE
NPI	1.00	.37**	.36**	.68**	.45**	-.48**
HSNS	-.08	1.00	.27*	.73**	.57**	-.84**
DT-N	.87**	-.15	1.00	.71**	.60**	-.32**
DT-M	.48**	.36**	.31**	1.00	.76**	-.63**
DT-P	.61**	.34**	.54**	.53**	1.00	-.67**
SE	.28**	-.59**	.34**	.02	-.37**	1.00

and correlating those correlations. As a result, this procedure reveals how similar the profile patterns are for each of the personality variables in our study. Following McCrae (2008) and Miller et al., (2010) we used a double entry method that allows us to control for both pattern of correlations and size of correlations. (Note: the tables associated with each specific area using a single entry correlation method – selfie behavior, motivation, etc. – are included in supplemental data.)

As can be seen in Table 9, NPI and dark triad narcissism have similar profiles. Vulnerable narcissism is not reliably related to NPI or dark triad narcissism. The dark triad traits share a similar profile (correlating 5 of 6 times positively), and self-esteem with two exceptions is negatively or unrelated to any of the other traits.

Study 2: Objective and Rating Data

In Study 2 we focus on the more objective data regarding selfies from the undergraduate sample described previously.

Methods

Instagram Data. Instagram is a social media site and smartphone application that is a popular outlet for posting selfies. Using the smartphone app, individuals can take a picture with their smartphone, edit it using a wide assortment of filters, embellishments, and crop and resize functions, and post it to Instagram as well as other popular social networking sites such as Facebook and Twitter. Once posted, pictures are visible to individuals who are "followers" and possibly the general public according to the account-holder's settings, and both the account-holder and other individuals can "like" (i.e., indicate their approval of the picture), comment, tag individuals or add hashtags to the picture. In addition, individuals can "follow" the account-holder, which allows them access to the account-holder's posts and profiles. Not every picture posted to Instagram can be categorized as a selfie; however, enough selfies have been posted that Instagram has become associated with selfies in the popular media. Instagram keeps a running total of likes, comments, posts, and followers as metrics of the account-holder's popularity and activity on the site.

During data collection, participants were asked to sign into their Instagram account in the lab. The researcher then took screenshots of the account, scrolling down to the end of the screen and letting older pictures load exactly four times for each participant. From these screenshots, those images identified by the researchers to be selfies were cropped into separate picture files and randomly presented to two out of eight possible naïve judges. Judges rated the selfies on visual characteristics (such as those previously tested with narcissism; Vazire et al., 2008),

subjective traits related to narcissism (e.g., attractiveness and status), the emotions the subject of the selfie appeared to be experiencing (inferred emotions; i.e., the six basic emotions), and the motivations the subject of the selfie appeared to have for taking the selfie (inferred motivations; e.g., showing off, getting closer to others).

Iconosquare Indices. Iconosquare is a website used in conjunction with an Instagram account to provide statistics on the account-holder's usage. These statistics include the number of posts, likes, and comments received on a monthly basis, the frequency of posting on each day of the week and each hour of the day, and the percentage of likes and comments received by followers vs. non-followers, in addition to the Instagram statistics of total likes, comments, posts, and followers.

During data collection, participants were asked to sign into Iconosquare using their Instagram account. Screenshots were taken of each page listed under the Statistics menu of Iconosquare, as well as the My Media page listed under the Viewer menu, which lists all media posted by the participant. For the latter page, the researchers scrolled to the bottom of the page and let older pictures load exactly four times for each participant.

Results

Iconosquare Indices. For the five pages of media collected from the My Media page of Iconosquare, the total number of pictures and the total number of selfies for each participant were counted. To account for differences in how many total pictures had been posted in Instagram, a percentage of selfies for each person was calculated. To account for differences in how long participants had been on Instagram, we calculated their average posts per month, as well as likes and comments received per month.

Dark triad narcissism was associated with a greater percentage of selfies on Instagram(r[199] = .22, 95% CI [.07,.36]). Personality was not significantly related to average posts or likes received. Participants high in Machiavellianism (r[199] = .21, 95% CI [.06,.35]) and psychopathy (r[199] = .24, 95% CI [.09,.38]) were more likely to receive likes from non-followers, while only participants high in Machiavellianism (r[199] = .16, 95% CI = [.01,.30]) were more likely to receive comments from non-followers.

There were also some differences in when postings were made suggesting a general preference for evening hours. This is consistent with past work on the dark triad and nocturnal habits (Jonason, Jones & Lyons, 2013). Participants high in NPI narcissism were more likely to post on Instagram between midnight and 2:00 am (average r[172] = .17, 95% CI[.02,.31]), whereas participants high in vulnerable narcissism were more likely to post between 2:00 and 4:00 am (average r[172] = .22, 95% CI[.07,.36]). Participants with high self-esteem were also less likely to post between 2:00 and 4:00 am, (average r[172] = -.20, 95% CI[-.34,-.05]) but participants high in psychopathy (average r[172] = .18, 95% CI[.03,.32]) and Machiavelliansim (average r[172] = .21, 95% CI[.06,.35]) were more likely to post between 2:00 and 5:00 am. Finally, those high in dark triad narcissism were more likely to post between 11:00 pm and 1:00 am, average r[172] = .18, 95% CI[.03,.32].

Ratings by Naïve Judges. All images identified as selfies from the My Media page of Iconosquare were cropped from the page (i.e., separated from other pictures of the same participant) and randomly presented to two of eight possible naïve coders. Each pair of two coders rated the same subset of selfies on a variety of aspects, including perceived traits, emotions, and motivations of the individual taking the selfie. In order to measure interrater reliability, random effects (between subjects) intraclass correlations (ICC's; Shrout & Fleiss,

Table 10. Correlations between personality and visual characteristics in Instagram selfies (Study 2). Note: NPI=Grandiose Narcissism; HSNS=Vulnerable Narcissism; DT-M=Dark Triad Machiavellianism; DT-N=Dark Triad Narcissism; DT-P=Dark Triad Psychopathy; SE=Self-esteem. 95% CI's available in supplemental data. * indicates significant correlations, *p*<.05.

	filter	graphics	pose	smiling	eye wear	fashion able	neat	cheerful	make up	cleav age	musc ular	provoc ative	sexy	duck lips	goofy
NPI	.10	.11	.04	-.05	-.06	.17*	.14	-.06	.15*	.11	.07	.00	.05	.10	-.04
HSNS	.08	.00	-.07	-.13	.04	.20*	.09	-.11	.08	.09	.03	.00	.09	.04	-.11
DT-M	.08	.05	.02	-.12	.02	.16*	.07	-.12	.05	.15*	.02	.07	.18*	.06	-.04
DT-N	.09	.10	.08	-.04	-.08	.03	.02	-.10	-.01	-.07	.12	-.08	-.07	-.03	-.03
DT-P	.13	.07	.04	-.21*	.01	.11	.06	-.23*	-.02	.00	.07	.11	.12	.19*	-.08
SE	-.13	-.03	-.07	.16*	.00	.00	-.01	.19*	-.04	.10	.07	-.12	-.18*	-.07	.01

1979) were conducted between each set of two coders' ratings for the same targets for each

aspect separately. ICC's for the majority of ratings fall in the "fair" range (i.e., .40-.75; Fleiss,

1986). The aspects for which ICC's were poor include whether participants struck a pose or

appeared muscular and judge-inferred self-esteem, attractiveness, intelligence, drive, fear, and

surprise. All of these aspects had ICC's below .4 and should be interpreted with caution. The

aspects for which ICC's were especially good include whether participants were smiling,

wearing eyewear or makeup, and appeared cheerful, fashionable or happy. All of these aspects

had ICC's above .75, showing excellent reliability.

As seen in Table 10, NPI and vulnerable narcissism showed similar profiles in terms of

visual selfie characteristics, and also resembled dark triad Machiavellianism and psychopathy

profiles. All of these traits except psychopathy positively predicted appearing fashionable to the

judges, appearing sexy to the judges (although this relationship was significant only for

Machiavellianism), having "ducklips" (although this relationship was significant only for

psychopathy) and wearing makeup in the selfie (although this relationship was significant only

for NPI narcissism) and negatively predicted appearing cheerful and smiling (although these

relationships were only significant for psychopathy). Machiavellianism positively predicted

showing cleavage/skin. Individuals high in self-esteem appeared to be more cheerful and smiling

and appeared less sexy to raters.

We next examined ratings of narcissism, self-esteem, likability, attractiveness and status.

Participants high in NPI narcissism appeared more narcissistic (r[199] = .16, 95% CI [.02,.29]),

to have higher self-esteem (r[199] = .18, 95% CI [.04,.31]), and to be more attractive (r[199] =

.16, 95% CI [.02,.29]). There were no significant associations with vulnerable narcissism or self-

esteem. Dark triad narcissism was related to appearing high in self-esteem (r[199] = .17, 95% CI [.03,.30]), and dark triad psychopathy (r[199] = 19, 95% CI [.05,.32]) and Machiavellianism (r[199] = .17, 95% CI [.03,.30]) were related to appearing high in narcissism.

Inferred emotions. NPI narcissism did not resemble any other personality traits in its pattern of inferred emotion and showed no significant relationship to inferred emotions. However, vulnerable narcissism (r[199] = -.15, 95% CI [-.28,-.01]) and psychopathy (r[199] = -.20, 95% CI [-.33,-.06]) showed negative relationships to happiness and largely positive relationships to sadness (HSNS, r[199] = .15, 95% CI [.01,.28]) and disgust (psychopathy, r[199] = .16, 95% CI [.02,.29]).

Inferred motivations. HSNS (r[199] = -.17, 95% CI [-.30,-.03]), Machiavellianism (r[199] = -.20, 95% CI [-.33,-.06]), and psychopathy (r[199] = -.16, 95% CI [-.29,-.02]) had negative relationships to more communal motives.

Profile analysis of object factors and ratings. We conducted a profile analysis using a double entry method for the full spectrum of correlations in this section. We found that the profile of the NPI narcissism looked similar to the dark triad traits and, to a lesser degree, vulnerable narcissism. Vulnerable narcissism looked similar to Machiavellianism and psychopathy but to a lesser extent dark triad narcissism. Self-esteem had no or a negative relationship with all traits (see Table 11).

General Discussion

In two large data sets we examined the associations between narcissism (grandiose and vulnerable), the dark triad, and self-esteem with selfie behavior that was self-reported (Studies 1 and 2) or assessed objectively and rated (Study 2). Given the large number of correlations, we will only focus on the major themes in the data. First, grandiose narcissism (as measured by the

NPI and SD3; the two had similar profiles in both samples) is generally associated with taking and posting more selfies – and especially true selfies with only the individual in it. Grandiose narcissism is associated with feeling good while taking selfies, and with the primary motivation for doing so being self-presentation. This is consistent with the approach-oriented nature of narcissism (Campbell et al., 2006; Foster & Trimm, 2008) and also consistent with the conceptualization of selfies as a self-regulatory act for narcissists. Consistent with past research on narcissism in photographs (e.g., Vazire et al., 2008), naïve observers are able to detect grandiose narcissism from selfies, but only to a modest extent, and also see grandiose narcissistic selfie takers as higher in self-esteem and attractiveness.

The link between vulnerable narcissism and selfies was generally weaker than for grandiose narcissism. Vulnerable narcissism was not associated with more selfies overall, although there was a positive link with selfies that include only the self and engagement with Instagram. In general, vulnerable narcissism was associated with more negative affect when taking selfies, consistent with the vulnerability and emotionality typically associated with vulnerable narcissism (Miller et al., 2011). The dark triad factors of psychopathy and Machiavellianism looked generally like grandiose narcissism, especially psychopathy. Psychopathy, however, had a little more negative affect involved in selfie taking.

Self-esteem differed markedly from the other traits in the study. It did not show a strong pattern of associations with selfies. Arguably the most pronounced finding with self-esteem was the lack of negative affect associated with selfie taking.

Overall, this work replicates and extends past research on narcissism and selfies. Notably we used multiple samples, self-reported data, objective data, and observed criteria. Grandiose narcissism is linked positively to selfie taking. This appears to be in part a self-enhancement

Table 11. Profile analysis of personality traits with regards to ratings by naïve judges. Note: NPI=Grandiose Narcissism; HSNS=Vulnerable Narcissism; DT-M=Dark Triad Machiavellianism; DT-N=Dark Triad Narcissism; DT-P=Dark Triad Psychopathy; SE=Self-esteem. * $p < .05$, ** $p < .01$

	NPI	HSNS	DT-N	DT-M	DT-P	SE
NPI	1.00	.47**	.60**	.76**	.58**	-.09
HSNS		1.00	.28*	.74**	.74**	-.42**
DT-N			1.00	.43**	.56**	-.15
DT-M				1.00	.80**	-.26*
DT-P					1.00	-.55**
SE						1.00

strategy (e.g., self-presentation, positive affect, appearance of self-esteem). Grandiose narcissism also appears to be successful in that it is associated with more "likes" and more "followers." The one downside in grandiose narcissism and selfies is the appearance of narcissism – at least to naïve observers.

Limitations

We used two reasonably large samples, but our more objective data were only based on a student sample. Data of this type are more challenging to collect than self-report data but are in some ways more interesting (especially in that they avoid common method bias). We would hope this type of work would be replicated and that other samples would be used.

This study was correlational, thus we can speculate about mechanism but do not have evidence of mechanisms. Ideally future research will include experimental paradigms and mediational methods that get at mechanisms more directly.

Conclusion

Along with results from other studies of selfies and social media more broadly, a picture of grandiose narcissism is emerging. Grandiose narcissism is well suited for social media in terms of engagement, positive affect, and self-presentational or self-enhancement motives. The only real downside we have seen is that grandiose narcissism is reflected, albeit darkly, in social media for all to see. Vulnerable narcissism, however, differs substantially from grandiose narcissism. Vulnerable narcissism is associated with negative affect and does not have the pay-off in terms of "likes" or likability that grandiose narcissism has. Overall, this suggests that vulnerable narcissism is not ideally suited for social media.

CHAPTER 4

A PSYCHOLOGICAL EXPLORATION OF ENGAGEMENT IN GEEK CULTURE

Introduction

A geek is traditionally defined as an enthusiast who develops expertise on a topic through exceptional determination and devotion (McArthur, 2008). The word "geek" is used to describe not only enthusiasts in science, technology, and engineering but also especially devoted fans of media (i.e., "fandom geeks"). Here, we refer to geek culture as a subculture of enthusiasts that is traditionally associated with obscure media (Japanese animation, science fiction, video games, etc.). However, geek culture is becoming an increasingly mainstream influence on contemporary culture. Geek culture includes a range of activities such as role-playing games (e.g., *Dungeons and Dragons*), science fiction (e.g., *Star Trek*), comic books, and dressing in costumes (i.e., cosplay). Although geek interests were once marginalized (Tocci, 2009), comic book movie adaptations (e.g., *Iron Man, Thor*; IMDb.com, 2013) are now major box office draws. Likewise, science-fiction (sci-fi) and fantasy themed video games (e.g., *World of Warcraft*) have become multi-billion dollar industries. There has also been enormous growth in geek conventions such as Comic-con and Dragon*Con. In the past year alone, New York Comic-Con, one of the premier geek conventions in the United States, attracted over 130,000 attendees (Con NYC, 2013) and Dragon*Con in Atlanta has grown from 2,400 fans in 1989 to 57,000 fans in 2013 (DragonCon, 2013).

Despite the popularity of geek culture, it has received little attention from the social sciences. Yet this increasing tendency of individuals to engage in a culture with heroic and

magical themes may be linked to important trends in our wider culture, such as increasing

narcissism (Twenge, Konrath, Foster, et al., 2008), thwarted belongingness (Putnam, 2001), and

the interface between technology and entertainment media. In the present paper, we have two

primary goals. First, we develop and validate the construct of geek engagement as participation

in specific activities represented at major geek conventions. Second, we describe and examine

three new theoretical accounts of geek culture related to the cultural trends above, which we refer

to as the *great fantasy migration hypothesis*, the *belongingness hypothesis*, and the *desire for

engagement hypothesis*. These theoretical accounts are not considered to be mutually

exclusive—participation in geek culture is almost certainly determined by multiple factors and

several of these hypotheses share predictions. This research is designed to be the first rather than

last word on these hypotheses.

To these ends, we present results from 7 studies (N=2354). These include construct

operationalization and scale development (Studies 1-2), and examination of personality, self-

concept, intelligence and other individual differences variables associated with geek engagement

as well as a social network analysis of geek culture (Studies 2-7). Before we begin, however, we

(a) define geek culture, and (b) describe three theoretical accounts.

What is Geek Culture?

According to a wide ranging review (Tocci, 2009), as early as the 1950's, the term

"geek" and the similar term "nerd" had been used to denote social outcasts in grade schools.

Nerds were considered to be socially awkward and overly intellectual, whereas geeks were prone

to obsessive interest in marginalized or obscure hobbies such as the *Dungeons and Dragons*

game, comic books, and personal computing. These definitions of "geek" and "nerd," while

common, are by no means official, and use of these terms varies between sources. For the sake of

simplicity, we will be using only the term geek in this paper to refer to obscure media enthusiasts. Both "geek" and "nerd" were pejorative terms until the 1980's, when the growing popularity of technology and computers made these former outcasts increasingly useful to society (Tocci, 2009). During this time, geeks began adopting the term for themselves to express pride in their membership in a media and computer-based subculture. A canonical list of media interests that were geeky began to form, including science-fiction and fantasy, comic books, roleplaying games, costuming, etc. These interests tended to share common themes, such as larger-than-life fantasy worlds (e.g., Tolkein's *Middle Earth*), characters with extraordinary abilities (e.g., Superman), the use of magic or highly advanced technologies (e.g., futuristic technologies in *Star Trek*), and elements from history (e.g., renaissance fairs) or foreign cultures (e.g., Japanese cartoons, or *anime*). Demonstrating knowledge of or devotion to these interests became a form of social currency between self-proclaimed geeks (Woo, 2012).

This identification with a set of media interests can be most clearly observed in geek conventions such as Comic-Con. These conventions provide a gathering space where attendees can attend panels, buy merchandise, and wear costumes to show their devotion to a particular show or comic book character. Historically, specific geek interests were too small to independently support a large convention, so at their inception geek conventions sought to include the full spectrum of topics that might be of interest to geeks (Woo, 2012). Broad inclusion at these conferences had three interesting outcomes. First, it created a broad geek culture rather than only specific subcultures. Second, it prompted cross-pollination across geek interests; for example, at the Dragon*Con parade you might find a zombie storm trooper, mixing Star Wars and Zombie genres. Finally, and directly germane to the present research, the list of interests included in a large geek convention can be considered a sample of canonical geek

interests. Thus, one way to operationalize a person's involvement in geek culture may be to quantify their involvement in each of the geek interests represented at a geek convention. Although this approach may miss some of the more marginal geek interests that are not represented at a geek convention, it provides us with a list of interests that geeks themselves have identified to be geeky.

Based on the information above, we have defined geek culture engagement as a first step to understanding why individuals engage in geek culture. Below we describe three original hypotheses that may help to explain individual geek engagement.

Theoretical Accounts of Participation in Geek Culture

Although geek culture has been the subject of little psychological study, anthropologists and communications researchers have begun to describe geek culture and provide several theoretical accounts of its widespread appeal (Jancovich, 2002; McArthur, 2008; Tocci, 2009; Whiteman, 2009; Woo, 2012a-b). Based on these theories, as well as several from the psychology literature, we have generated three hypotheses. The present data only speaks to why an individual may choose to participate in geek culture. Further research is needed to understand why geek culture is becoming increasingly prominent in contemporary American culture. Please note that it is not our intention to link geek culture with psychiatric dysfunction or antisocial behavior. We have conducted no clinical assessments of any kind. Our theoretical accounts refer to variations in normal personality traits that are not necessarily maladaptive and may even be adaptive in some contexts. Our aim is simply to describe and understand individual motivations for participating in geek culture.

The "Great Fantasy Migration" Hypothesis

In US society, inflated self-esteem and narcissism—which have increased steadily over the past few generations—are being met with a harsh reality of low youth employment and high debt loads (Twenge et al., 2008; Twenge & Campbell, 2009; Twenge, Campbell, & Gentile, 2012). Separate from Narcissistic Personality Disorder (NPD), narcissism is a normal personality trait characterized by a grandiose sense of self as well as efforts to maintain that sense of self in the face of reality (Morf, Rhodewalt, 2001). Narcissists can be charismatic (Paulhus, 1998), confident (Emmons, 1984), or even emerge as effective leaders (Rosenthal & Pittinsky, 2006), but when faced with failure or criticism, narcissists tend to protect their sense of self through such strategies as discrediting the source of the criticism (Kernis & Sun, 1994) and withdrawing from challenging tasks in favor of easier routes to self-enhancement (Wallace, Ready, & Weitenhagen, 2009). In the United States, narcissism has been increasing since the 1970's, while traditional ways of supporting narcissism such as prestigious jobs and credit (e.g., the debt bubble collapse) are becoming less viable for the majority of Americans. The result for individuals is discomfort (or cognitive dissonance; Festinger, 1957) with the incongruence between inflated sense of self and deflated reality (Twenge & Campbell, 2009). One solution for resolving this dissonance is to migrate into a fantasy world via role playing games, fandoms, and fantasy media. These hobbies present opportunities for living out a grandiose self (e.g., by role playing a powerful or charismatic character) that might not be possible in the non-fantasy world. And, of course, in some cases success in fantasy (e.g., tournament gaming, achieving cosplay fame) can lead to real world success. In addition, it is easier to obtain expert status and admiration for one's knowledge of geek subjects (e.g., *Star Trek* trivia) because credentials such as education and certification are not required. Thus, narcissistic individuals who are unable to

receive the admiration and praise to which they feel entitled (whether because of failure, or because their grandiose fantasy is impossible to live out in the real world) may turn to a fantasy world where such praise is more easily obtained.

If the great fantasy migration hypothesis is correct, we should see a correlation between narcissism and participation in geek culture, and perhaps more strongly to the more roleplaying and immersive elements of geek culture. We should also see higher levels of fantasy proneness, a personality trait associated with elevated fantasizing and magical beliefs (Lynn & Rhue, 1986), among individuals engaged in geek culture. Fantasy proneness can be defined as a tendency to have intense daydreams, to have difficulty distinguishing between fantasy and reality, and to have magical or pseudoscientific beliefs. Although fantasy proneness has typically been associated with dysfunction, recent work has shown it to have two factors: a factor associated with strong imagery and strange beliefs and a factor associated with daydreaming and enjoyment of fantasy (Klinger, Henning, & Janssen, 2009). While the former factor is associated with dysfunction, the latter is not. Thus, normally occurring levels of fantasy proneness may positively predict geek engagement even in normally functioning individuals. Finally, to the extent that individuals participate in geek culture we should see reduced civic engagement and less engagement in real life goals, such as career aspirations and raising a family, as these would likely be less viable sources of praise and esteem and thus would be less rewarding to narcissists than geek culture activities.

The Belongingness Hypothesis

Belongingness, or the desire to form and maintain stable interpersonal relationships, is theorized to be a basic human need (Baumeister & Leary, 1995). Self-Determination Theory (SDT; Deci & Ryan, 1980) lists relatedness (an equivalent construct) as one of the three basic

needs that motivate human behavior, implying that much of an individual's choices and interests in life will be in service to this need. Leary et al. (1995) propose that self-esteem is contingent upon acceptance from others, and Social Identity Theory (Tajfel & Turner, 1979) states that individuals seek to join and identify with groups (such as fan groups; Trepte, 2006) to maintain that self-esteem. Thus engagement in geek culture may be distinguished by the particular strategy of using common media interests to fulfill needs for belongingness.

The above statement is consistent with anthropological work on geeks. Woo (2012b) characterized geek culture as a way of creating community in an increasingly individualistic society. Because traditional resources for fulfilling belongingness needs such as civic groups, the nuclear family, and strong communities have weakened or all but disappeared for the current generation (Putnam, 2001), Woo proposed that geeks gain belongingness by rallying around the resources that are currently available: consumer goods and cultural artifacts. Woo's hypotheses were supported by his finding that geeks use knowledge of geek interests (e.g., *Star Trek* trivia) and collections (e.g., model spaceships) as social currency (Woo 2012a). Along the same vein, Tocci (2009) described a process by which people who are outcast or rejected as children devote more energy to exploring solitary interests, including obscure interests, and eventually form ties to others with the same specialized interests, thereby forming a network of relationships based around previously solitary activities. He theorizes that the internet has amplified this process by providing increased access to information on obscure interests as well as a way to connect anonymously with others who share those interests. Via the internet, individuals who have rare and unusual interests can more easily find and contact each other as well as recruit new

enthusiasts. These sources suggest that geek culture may provide a path to fulfilling belongingness that is more accessible for certain individuals because it is based on (previously) solitary interests and hobbies and uses one's devotion to them as social capital.

If the belongingness hypothesis is correct, we can expect that participants will report greater positive self-feelings when engaging in activities they believe others will accept them for, in keeping with past research on belongingness (Leary, 1995). We also expect individuals who expect greater acceptance from important others when engaging in geek activities to identify more strongly as a geek, consistent with Social Identity Theory. We can also expect that those with higher levels of geek engagement will report closer associations or ties with others who share those interests. The latter phenomenon is commonly referred to in the social sciences as homophily (Mcpherson, Smith-lovin, & Cook, 2001) or in Social Identity Theory as felt closeness to one's group (Tajfel & Turner, 1979).

The Desire for Engagement Hypothesis

Mizer (2013) and Konzack (2006) see geek culture as a counterculture against a growing power differential in the media. As entertainment becomes monopolized by a few commercial entities and the public is expected to be increasingly passive receptors of media, individuals who identify as geeks seek to actively participate in their entertainment by role-playing, creating fan-fiction, and behaving as though fictional universes are real. Mizer calls the latter activity the "ironic imagination" and describes it as particularly dependent on social interaction, as getting multiple people to treat a fantasy universe as real can extend the escapism beyond the original work of fiction. Consistent with this view, fandom members (who fit the definition of a geek) have been shown to distinguish themselves from more passive media consumers through their

agency in shaping media (Whiteman, 2009), their ability to handle extreme or taboo content (Jancovich, 2002), and their active intellectual engagement (McArthur, 2008; Twenge et al., 2012) with media, at times referring to non-geeks as less intelligent or aware (McArthur, 2008; Twenge et al., 2012). Therefore, geek culture may be distinguished by the tendency to actively participate in one's own escapism and entertainment, especially in tandem with other people.

It may be that these individuals engage more with media because of a greater need for stimulation, whether intellectual or emotional. Individuals high in certain traits associated with the need for stimulation, such as need for cognition (which refers to the enjoyment of thinking and preference for more complex tasks; Cacioppo & Petty, 1982) and sensation seeking (which refers to the desire for new experiences and novelty; Zuckerman, Kolin, Price, & Zoob, 1964) as well as openness to experience (which includes preferences for variety and appreciation of aesthetics; McCrae & Costa, 1999) may find active participation in media (such as roleplaying and game playing) and more novel and unusual media content (such as fantasy and science fiction) preferable to mainstream media. If this is true, individuals high in need for cognition and sensation seeking may be more likely to be engaged in geek culture. In addition, creative individuals are known to need stimulation and novelty (Martindale, 1999) and a significant portion of geeks' engagement with media takes place through creative activities (e.g., Anime subbing and fanfiction; Denison, 2011a-b). It may be that individuals high in creativity may also be more likely to engage in geek culture. Finally, because geek media deals mainly with fantasy content, fantasy proneness may make such people even more likely to choose geek culture to fulfill their entertainment needs.

If the desire for engagement hypothesis is correct, we would expect people high in need for cognition, creativity, sensation seeking, and openness to experience to report higher levels of geek engagement. We would also expect intelligence, which is known to have relationships to need for cognition (Fleischhauer, Enge, Brocke, et al., 2010) and openness (Ashton, Lee, Vernon, & Jang, 2000; Aitken, 2004), to be positively related to geek engagement, consistent with the stereotype that geeks are particularly intelligent. Finally, because fantasy proneness, openness to experience, and adaptive (nondysfunctional) levels of schizotypal personality and dissociation form a constellation of traits that positively predict creativity (Lynn & Rhue, 1986; Aitken, 2004; Miller & Tal, 2007; Schuldberg, 2001), we predict that the latter two traits will be associated with geek engagement as well.

The Present Research

The present research aims to: (a) provide preliminary tests of the above hypotheses by exploring the individual differences and social behaviors associated with geek culture engagement and (b) operationalize geek culture by creating measures of geek culture involvement and identity. All studies (except Study 2) used participants from Amazon's Mechanical Turk (MTurk), which have been shown to give data of similar quality to traditional samples (Buhrmester, Kwang, & Gosling, 2011; Casler, Bickel, & Hackett, 2013). All studies in this paper were approved and monitored by the Institutional Review Board of the University of Georgia (Approval numbers: Study 1 2013106420; Study 2 STUDY00000229; Study 3 STUDY00000203; Study 4 STUDY00000563; Study 5 STUDY00000273; Study 6 STUDY00000413; Study 7 STUDY00000783). Participants gave informed consent by clicking "I consent" on a consent script in all studies except for Study 2; for Study 2, participants gave written consent by signing a consent form. Studies varied between using general samples and

Table 12. Characteristics of Samples 1-8. Note: All demographics were determined by self-report (i.e., participants chose which of the available terms best described them.)

Study	N	Gender % Male	% Race White	Black	Asian	Hispanic	Mixed Race	Age Mean	SD	Income Per Year (in thousands) % <$20	% $20-$75	% >$75
1 (S A)	350	54	67	9	8	1	12	29.3	8.5	20	60	20
1 (S B)	317	44	78	7	6	1	7	34.5	13.07	23	59	17
2	202	50	88	4	5	4	6	30.2	10.07	19	60	21
3	334	39	73	6	4	0	13	34.6	12.32	23	58	19
4	348	36	71	7	5	0	11	35.9	13.39	24	60	17
5	226	43	77	6	4	0	12	35.3	12.89	17	66	17
6	396	38	83	7	3	1	8	36	18.27	19	56	23
7	181	41	86	8	8	0	11.1	30	8.5	22	61	15

self-described geek samples. Details of all samples are reported in Table 12. Where appropriate, the series mean was imputed for all missing data values in this and all remaining studies. For the majority of questions in all studies less than 1% of values were imputed, and the highest percentage was 3% in Study 4. However, the results of Study 4 did not differ whether or not missing values were imputed.

Study 1 employs two samples to develop and validate the Geek Culture Engagement Scale (GCES) and Geek Culture Engagement Scale Short Form (GCES-S). The GCES and/or GCES-S is used in all subsequent studies. Study 1 also examines the relationships between geek engagement and personality traits relevant to all three hypotheses. *Study 2* further explores the measurement of geek engagement by having trained raters as well as naïve coders rate photographs of attendees of a major geek convention (i.e., Dragon*Con), and provides further validation for the GCES-S. *Study 3* examines the great fantasy migration hypothesis by measuring civic engagement among those reporting geek culture interests. *Study 4* examined the belongingness hypothesis. Participants rated each geek interest or activity from the GCES in

terms of how they feel others will react to their engagement in that activity, as well as how they feel when they engage in the interest or activity and how often they engage in each activity. Study 4 also develops the Geek Identity Scale (GIS) to test whether self-identifying as a geek is related to geek engagement and belongingness motives. *Study 5* presents a homophily analysis of the egocentric networks of 182 individuals. *Study 6* tests the need for engagement hypotheses by testing the relationship between geek engagement and measures of fantasy proneness and associated traits, IQ, Big Five personality, need for cognition, and sensation seeking. Finally, *Study 7* examines creativity in geek culture.

This manuscript reports results of all (N=7) studies we have conducted to date using the GCES either here or online at https://osf.io/u25x9/ (i.e., there is no file drawer effect; Rosenthal, 1979). Furthermore, data files for all studies are available on the same site.

Study 1

We first sought to operationalize geek culture by creating a scale that could be used to test our hypotheses. Because geek culture defines itself through identification with media interests, we proposed that geek culture engagement could be operationalized by quantifying participation in the interests and activities present at major geek conventions. We thus combined the activities and genres listed in the programs of the internationally successful multigenre convention, Dragon*Con, and added in non-redundant geek-related activities from two other conventions local to Atlanta (Furry Weekend Atlanta and Frolicon, a science fiction and kink convention) to create a representative sample of geek activities. Based in Atlanta, GA, Dragon*Con drew over 57,000 members in 2013, and offers over 30 different "fan tracks" reflecting the varied interests and niches of geek culture (DragonCon, 2013). In two Amazon MTurk samples, we used a listing of these fan tracks as well as several measures of personality

and emotional needs to begin to validate the construct of geek culture engagement and explore its nomological network (i.e., the set of lawful relationships that define geek culture in relation to other constructs; Lord, Novick, & Birnbaum, 1968). In our choice of personality measures, we also began to explore all three theoretical accounts by exploring the relationships between geek engagement and narcissism, Big Five personality, and basic emotional needs.

Methods

Procedure

Samples A (N = 350) and B (N = 317) completed the study online. For Sample A, the Amazon MTurk posting was worded to attract people who are engaged in geek culture and to discourage people without interests in geek culture activities from participating (exact wording for all studies is posted online at https://osf.io/u25x9/). For Sample 2, The MTurk posting was worded as generically as possible so as to recruit participants with a variety of geek engagement levels. Participants indicated their consent by clicking "I consent" on a consent script and completed the measures via an online survey hosting website before being compensated via MTurk. Thirty participants were found to have already participated in Sample A and were removed from Sample B.

Materials

To test the nomological network of geek engagement, we included measures we theorized to have relationships with geek engagement along with related traits (e.g., we included all of the Big Five Personality Traits (McCrae & Costa, 1999), although openness had the most theoretical interest). To this end we included measures of grandiose and vulnerable narcissism and entitlement (predicted by the great fantasy migration hypothesis), and the SDT basic psychological needs (relatedness, predicted by the belongingness hypothesis; La Guardia, Ryan,

Couchman, & Deci, 2000). We also included measures of SDT motivational orientation (i.e.,

how oriented an individual is toward aspects of the environment that encourage autonomy, are

controlling, or are under the control of the individual; Deci & Ryan, 1985), although we made no

specific predictions relating to these measures, and depression and life satisfaction, as these

would be negatively related to fulfilled ego or belongingness needs.

Geek engagement. To create the *Geek Culture Engagement Scale (GCES)*, we generated

a list of 37 geek activities (e.g., cosplay, gaming), interests (e.g., science fiction, fantasy) and

lifestyles (e.g., lolita, furry) based on the listing of fan tracks on the Dragon*Con website. We

also included the item "your real (daily) life" to explore whether participants who were more

involved in geek activities were less involved in daily life. We then asked participants to indicate

to what extent they participated in each item on a scale from 1 (*a little*) to 5 (*a lot*). See Table 2

for the specific items assessed by the GCES. See Appendix for the full scale.

Grandiose narcissism. The *Narcissistic Personality Inventory* (NPI; Raskin & Terry,

1988) is a 40-item nonclinical measure of dimensional narcissism (Samples A and B Cronbach α

= .89). For each item, participants choose which of two statements (e.g., "I like to be the center

of attention"/ "I prefer to blend in with the crowd") best describes them. Scores range from 0-40

with higher scores indicating more narcissism.

Hypersensitive (vulnerable) narcissism. The *Hypersensitive Narcissism Scale* (HSNS;

Hendin & Cheek, 2013) is a 10-item scale (Sample A α = .73; Sample B α = .80) designed to

measure vulnerable narcissism. Items such as "my feelings are easily hurt by ridicule or the

slighting remarks of others" are rated on a Likert-type scale from 1 (*not at all like me*) to 5 (*very

much like* me). Items range from 0-50 with higher scores indicating more vulnerable narcissism.

Self-esteem. The *Rosenberg Self-Esteem Scale* (RSES; Rosenberg, 1989) is a widely used 10-item measure (Sample A α = .91; Sample B α = .93) of explicit self-esteem. Items such as "on the whole, I am satisfied with myself" are rated on a scale from 1 to 5 with 1 signifying "*this statement does not describe me in the slightest*" and 5 signifying "*this statement describes me perfectly*."

Depression. The *Center for Epidemiological Studies Depression Scale* (CES-D; Radloff, 1977) is a 20-item self-rating inventory (Sample A α = .93; Sample B α = .94) that is widely used in the measure of nonclinical depression symptoms (e.g., "I felt depressed"). Respondents rated a list of symptoms on a scale from 0 (*rarely/none of the time, less than 1 day*) to 3 (*most or all of the time, 5-7 days*) as to how often they have experienced each symptom in the past week.

Entitlement. The *Psychological Entitlement Scale* (PES; Campbell, Bonacci, Shelon, Exline, & Bushman, 2004) is a 9-item measure of generalized entitlement (Samples A and B α = .89), which is one of the central components of narcissism (Ackerman, et al., 2011), defined as the belief that one deserves better treatment than others. The PES allows for a more targeted assessment of entitlement than the NPI or HSNS (Campbell et al., 2004). Participants indicated their agreement with items such as "great things should come to me" on a scale from 1 (*strongly disagree*) to 7 (*strongly agree*).

Big five personality. The *Five Factor Model Rating Form* (FFMRF; Mullins-Sweatt, Jamerson, Samuel, Olson, & Widiger, 2006) is a 30-item measure of the Big Five personality traits. Participants indicated their identification with each individual facet of the Big Five traits, including agreeableness (e.g., "straightforwardness"; Sample A α = .67; Sample B α = .70), extraversion (e.g., "gregariousness"; Sample A α = .73; Sample B α = .77), conscientiousness

(e.g., "competence"; Sample A α = .80; Sample B α = .82), neuroticism (e.g., "anxiousness"; Sample A α = .78; Sample B α = .81), and openness to experience (e.g., "fantasy"; Sample A α = .67; Sample B α = .66) on a 5-point Likert scale.

　　　Life satisfaction. The *Diener Satisfaction with Life (SWL) scale* (Diener, Emmons, Larsen, & Griffin, 1985) is a 5-item scale (Samples A and B α = .92) of subjective well-being. Participants rated items such as "I am satisfied with my life" on a 7-point scale (1 = *strongly disagree*; 7 = *strongly agree*).

　　　Self-determination. The *General Causality Orientations Scale* (GCOS; Deci & Ryan, 1985) is a measure of self-determination in personality (Hodgins, Koestner, & Duncan, 1996). It features 17 vignettes describing hypothetical situations. For each vignette, participants rated the likelihood of their pursuing three possible courses of action on a 7-point scale (1 = *very unlikely*; 7 = *very likely*). These courses of action represent three dimensions of self-determination, autonomy (Sample A α = .84; Sample B α = .87), controlledness (Sample A α = .71; Sample B α = .73), and impersonal (Sample A α = .85; Sample B α = .84).

　　　Basic psychological needs. The *Basic Psychological Needs Scales* (BPNS; La Guardia et al., 2000; Baard, Deci, & Ryan, 2004) is a collection of scales measuring the basic motivational needs of autonomy (Sample A α = .76; Sample B α = .75), competence (Sample A α = .76; Sample B α = .77), and relatedness (Samples A and B α = .80) in the workplace, in relationships, and in general.

Results

Factor analyses and scale validation

In order to validate the GCES, we conducted maximum likelihood exploratory factor analysis (Promax rotation) on Sample A, which we then replicated via confirmatory factor analysis in Sample B. An eight factor solution (from which the item "conventions" was removed because it produced a Heywood case; Heywood, 1931) was found to be the best fit for the data (χ^2 (370) = 612.45, p < .001, χ^2/df = 1.66, CFI = .95, TLI = .92, RMSEA = .04, 90% CI [.04,.05], SRMR = .03). These factors were easily interpretable as clusters of related activities and are shown in Table 13. For example, we named factor 1 "Roleplaying" because it appeared to feature both live action role playing (LARP) games and table top role playing games (e.g., *Dungeons and Dragons*). The items computer/console gaming, internet forums, social networking sites, cartoons, real life, and skepticism failed to load at .4 or greater on a factor, while horror loaded on its own separate factor. Because comic books appeared to crossload on more than one factor, it and the above items were omitted from the scale and from further analyses in this study and all subsequent studies. As "Real life" is not an item intended to measure geek culture, this item has been excluded from analyses in all subsequent studies as well as Sample B of this study. A summary of its relationship with Geek Engagement can be found in the meta-analysis portion of this paper. All seven resulting factors were intercorrelated, rs = .14 to .70; all of these correlations were positive, suggesting that geek engagement is rarely limited to one cluster of activities. This seven factor solution was tested via confirmatory factor analysis on Sample 2 (χ^2 (303) = 684.00, p < .001, χ^2/df = 2.26, CFI = .89, TLI = .87, RMSEA = .06, 90% CI [.06,.07], SRMR = .06) and showed tolerable fit, suggesting that this factor solution is stable. The item Cinema was dropped at this stage because it failed to load significantly on any factor in the CFA solution.

Table 13. Exploratory factor analysis of geek engagement. Extraction Method: Maximum Likelihood; Rotation Method: Promax with Kaiser Normalization.
Note: Bolded items were retained for the final GCES.

	Role Playing	Hobbies	Puppetry Robotics	Japanese	Genres	Theater	Life Styles	Horror
LARP	**.613**	.348	.298	.208	.035	.105	.344	.168
Tabletop	**.835**	.481	.257	.188	.255	.260	.327	.207
Computer Gaming	.351	.045	-.117	.135	.329	.100	.013	.197
Cosplay	.507	**.561**	.448	.367	.135	.341	.416	.230
Internet	.139	.067	.016	.222	.203	.189	.103	.210
Renfaire	.477	**.741**	.248	.194	.172	.461	.346	.313
SCA	.493	**.839**	.476	.203	.057	.309	.436	.218
Weapons	.391	**.526**	.400	.179	.113	.044	.353	.274
Paranormal	.338	**.549**	.338	.113	.154	.311	.401	.517
Puppetry	.416	.597	**.812**	.262	.042	.326	.525	.236
Robots	.472	.401	**.592**	.260	.154	.215	.238	.281
Theater	.402	.478	.483	.241	.181	**.627**	.284	.312
Creative Writing	.239	.293	.117	.232	.215	**.450**	.180	.453
Social Network Sites	.207	.138	-.020	.054	.085	.237	.062	.266
Real Life	.015	-.029	-.184	-.056	.122	-.011	-.202	.122
Fantasy	.248	.115	-.193	.313	**.608**	.143	.046	.322
SciFi	.220	.067	-.001	.214	**.861**	.198	.005	.228
Anime	.204	.134	.073	**.907**	.263	.135	.122	.156
Manga	.222	.208	.256	**.855**	.171	.209	.251	.151
Comics	.384	.244	.278	.326	.275	.383	.147	.377
Horror	.214	.224	.122	.176	.228	.249	.285	.717
Broadway	.319	.427	.192	.275	.252	**.701**	.268	.319
Alternative History	.393	.389	.221	.298	.424	**.482**	.292	.420
Cartoons	.140	.288	.111	.242	.231	.358	.139	.375
British Series	.220	.197	-.003	.176	**.516**	.491	.059	.263
Filking	.437	**.601**	.469	.294	.149	.503	.458	.252
Cinema	.185	.204	.268	.106	.229	.460	.103	.427
Joss Whedon Films	.204	.257	.084	.158	.457	**.508**	.158	.426
Rocky Horror	.406	.465	.295	.209	.195	**.635**	.418	.410
Skeptic	.118	.049	-.091	.054	.265	.154	.196	.297
Lolita	.379	.441	.362	.280	.046	.210	**.808**	.287
Gothic	.341	.325	.148	.156	.114	.281	**.671**	.456
Furry	.410	.483	.512	.253	.030	.184	**.759**	.128
Pagan	.424	.520	.329	.182	.115	.283	**.719**	.342
BDSM	.411	.470	.261	.246	.094	.302	**.721**	.383
Polyamore	.443	.522	.420	.150	-.032	.241	**.608**	.240

Table 14. Correlations between GCES (full and short form) and Personality Measures in Samples 1 and 2. Note: 95% Confidence intervals in brackets. Confidence intervals not containing 0 in bold. NPI = Narcissistic Personality Inventory; RSE = Rosenberg Self-Esteem; HSNS = Hypersensitive Narcissism Scale; N = Neuroticism; E = Extraversion; O = Openness to Experience; A = Agreeableness; C = Conscientiousness; CESD = Center for Epidemiological Studies Depression Scale; SWB = Subjective Well Being

Sample	NPI	RSE	HSNS	Entitlement	N	E	O	A	C	CESD	SWB
S1	**.29** [.19,.39]	-.03 [-.14,.07]	**.13** [.02,.23]	**.19** [.09,.29]	**.19** [.09,.29]	**.26** [.16,.36]	**.30** [.20,.39]	.02 [-08,.13]	.01 [-10,.11]	**.32** [.23,.41]	**.12** [.02,.23]
S2	**.27** [.16,.37]	**-.15** [-.26,-.04]	**.16** [.05,.26]	**.15** [.04,.25]	**.21** [.11,.32]	**.21** [.10,.31]	**.26** [.15,.36]	.06 [-05,.17]	.00 [-11,.11]	**.33** [.23,.42]	.08 [-.03,.19]
S1 (Short)	**.30** [.20,.39]	-.04 [-.14,.07]	**.13** [.03,.24]	**.24** [.14,.34]	**.18** [.07,.28]	**.28** [.18,.37]	**.25** [.15,.35]	.01 [-09,.12]	.01 [-09,.12]	**.30** [.20,.39]	**.14** [.04,.24]
S2 (Short)	**.25** [.14,.35]	**-.17** [-.27,-.06]	**.13** [.02,.23]	**.14** [.03,.25]	**.19** [.08,.29]	**.18** [.07,.29]	**.19** [.08,.29]	.04 [-07,.15]	.01 [-10,.12]	**.30** [.19,.40]	.09 [-.02,.20]
S1 (Specialists Only)	**.28** [.04,.48]	-.02 [-.26,.22]	.15 [-.09,.38]	.14 [-.10,.37]	-.06 [-.30,.18]	.21 [-.03,.43]	-.07 [-.30,.17]	-.17 [-39,.07]	.11 [-13,.34]	.23 [-.01,.44]	.17 [-.08,.39]
S2 (Specialists Only)	.20 [-.02,.39]	-.13 [-.34,.08]	.02 [-.19,.24]	.05 [-.16,.26]	.11 [-.11,.31]	.03 [-.18,.24]	.28 [.07,.46]	**-.25** [-.44,-.04]	-.04 [-.25,.17]	.16 [-.05,.36]	-.15 [-.35,.06]

Zero order correlations and regressions

To begin to test our theoretical accounts of geek culture, and to further validate geek engagement and its factors as constructs, we explored geek culture's nomological network—the network of lawful relationships (Lord et al. 1968) that defines geek engagement in relation to other constructs. To do this, we first calculated a full-scale geek engagement score as the average of the responses for each item in the GCES (Sample A α = .92; Sample B α = .95) and measured its zero order correlations with the other personality measures in Samples A and B. These relationships are shown in Table 14. The subscales of both the BPN scale and the GCOS showed no significant relationships to geek engagement in Sample A, but geek engagement was associated with thwarted autonomy needs, $r(315) = -.13$, 95% CI [-.24,-.02], lower autonomy orientation, $r(315) = -.25$, 95% CI [-.35,-.15], and higher impersonal orientation, $r(315) = .13$,

95% CI [.02,.24] in Sample B. In both samples, geek engagement showed the same pattern of positive correlation with narcissism, vulnerable narcissism, neuroticism, openness to experience, depression, extraversion, and entitlement.

Because we conceptualized geek engagement as being elevated or higher when individuals are engaged in multiple geek activities, we wanted to test whether the above pattern of relationships differed for geek "specialists," or individuals who were strongly interested in only one or two geek activities. We therefore separated individuals who answered 4 or 5 for only one or two activities (Sample A: N=68; Sample B: N=86) from the rest of the sample (excluding those who did not endorse geek engagement at all) and reran the correlations (see Table 3). In Sample A, although lack of power caused several relationships to lose significance, the relationships differed little in terms of direction and magnitude, with the exception of the Big Five traits neuroticism, openness, agreeableness and conscientiousness and depression. In Sample B, however, only the relationships between narcissism, self-esteem, and openness to experience remained similar. This suggests that specialist geeks may differ from generalist geeks in important ways and that the GCES as it is used in this paper speaks best toward generalist geeks.

We then conducted a series of multiple regressions in order to control for relevant demographic variables. The first multiple regression analysis predicted geek engagement with age, gender, SES, and all of the personality variables. In Sample A, gender, grandiose narcissism, openness, extraversion, depression, and subjective well-being maintained significance. Their continued significance suggests that these relationships are independent of gender and age. For Sample B, grandiose narcissism, depression, and subjective well-being maintained significance. The second multiple regression analysis predicted geek engagement

with age, gender, SES, and all of the SDT variables. Although impersonal causality orientation no longer predicted geek engagement, autonomy causal orientation maintained significance in both samples. The results of these and all further regression analyses in the paper can be found online at https://osf.io/u25x9/. Geek engagement showed a significant correlation to gender in both samples, $rs = .13-.20$, in that males showed significantly higher geek engagement, and showed a negative correlation to age in Sample B, $r(315) = -.14$, 95% CI [-.25,-.03].

The variables loading on each factor were then averaged to produce seven unique subscales for the GCES: Lifestyles (Sample A α = .87; Sample B α = .90), Theater (Sample A α = .79; Sample B α = .82), Hobbies (Sample A α = .81; Sample B α = .87), Puppetry/Robotics (Sample A $r = .55$; Sample B $r = .70$), Japanese (Sample A $r = .77$; Sample B $r = .81$), SciFi/Fantasy (Sample A α = .68; Sample B $r = .79$), and Roleplaying (Sample A $r = .50$; Sample B $r = .67$). The relationships between these factor scores and the personality measures in Samples A and B are shown online at https://osf.io/u25x9/.

Testing the great fantasy migration hypothesis

The great fantasy migration hypothesis predicts that individuals high in narcissism will score higher in geek engagement. However, it also posits that narcissism will be particularly related to engagement with the more roleplaying and immersive elements of geek culture, because these provided the greatest opportunities for playing out grandiose fantasy. We classified the following subscales as immersive subscales because each contained activities that have a strong emphasis on playing a role (which would allow someone to self-enhance): Lifestyles (e.g., Lolita), Hobbies (e.g., cosplay), Theater (e.g., theater), Roleplaying (e.g., LARPing), and Puppetry/Robotics (e.g., Puppetry). Grandiose narcissism was positively associated with all five subscales in Sample A ($rs = .21-.34$) and all but Hobbies in Sample B (rs

= .20-.34), but was also significantly related to Japanese (Sample A: r = .13; Sample B r =.14) in both samples. Vulnerable narcissism predicted Lifestyles, Theater, and Puppetry/Robotics in Sample A (rs = .13-.14) and Lifestyles and Puppetry/Robotics in Sample B (rs = .13-.14) but also predicted Japanese in both samples (rs = .14). In a series of regressions containing all the personality grandiose and vulnerable narcissism, self-esteem, the Big Five personality traits, subjective well-being, and depression) and demographics variables (age, gender, and SES), grandiose narcissism no longer predicted Japanese or Hobbies engagement and vulnerable narcissism no longer predicted any subscale scores. These results suggest that although grandiose narcissism does predict most of the immersive elements of geek culture when controlling for demographics, it does not predict hobbies beyond demographics, and vulnerable narcissism does not predict the immersive elements of geek culture when controlling for demographics.

Sample differences

We then tested the differences between geek engagement scores in Sample A (which targeted geeks only) and Sample B (which targeted both geeks and non-geeks). The mean geek engagement score of Sample B (M = 1.91, SD = .72) was significantly lower than the mean of Sample A (M = 2.27, SD = .67; t[268] = -8.98, p < .001; d = .52), suggesting that we were successful in recruiting more people with geek interests in Sample A than in Sample B. We used a series of z-tests to compare the correlations with our personality variables across samples. No significant differences arose, suggesting that the relationships between geek engagement and personality are consistent across multiple samples.

A short scale

Because of the growing need for brief or concise measures (Saucier, 2010), we created a shortened version of our scale, the *Geek Culture Engagement Scale Short Form* (GCES-S) by

taking the two items with the highest loadings on each factor from the Sample A factor analysis. The measure is posted online at https://osf.io/u25x9/. This short measure showed the same general pattern of relationships with the above personality variables in Samples A and B (see Table 3) and showed no significant differences in its correlation with any individual differences variables.

Discussion

Study 1 created and validated the GCES, while also beginning to test the great fantasy migration and belongingness hypotheses. The GCES and the GCES-S appear to show good reliability and a stable seven-factor structure. Geek culture engagement appears to be a valid construct in that it consistently relates to grandiose narcissism, openness, extraversion, depression, and subjective well-being, showing a stable nomological network. One limitation of the scale arose: although few participants reported high engagement in only one or two geek activities, those few differ from other geeks in terms of Big Five personality traits. Thus caution is recommended when using this scale with geek specialists in the future. In addition, researchers are cautioned that the GCES is not an exhaustive list of geek interests, and might miss some marginal geek interests.

The GCES's consistent relationships to narcissism, depression, and subjective well-being provide preliminary support for the great fantasy migration hypothesis. In addition, grandiose narcissism is related to those subscales involving immersive elements (with the exception of hobbies), while it is unrelated to the Genres and Japanese subscales (which involve simply consuming fantasy, science-fiction, and Japanese media) after controlling demographics. This is only partially consistent for the great fantasy migration hypothesis. Grandiose narcissism was not

related to hobbies, although this may be because although hobbies includes cosplay (a roleplaying element), the majority of hobbies listed do not provide strong opportunities to self-enhance. In addition, vulnerable narcissism was not related to any of the immersive elements of geek culture after controlling for demographics. This implies that only grandiose narcissism is related to fantasy migration.

Finally, the results of Study 1 are inconsistent with the belongingness hypothesis. Although in Sample B the scale showed relationships to measures of Self-Determination Theory (Deci & Ryan, 1980) consistent with thwarted autonomy needs, there was no correlation to relatedness needs. Thus we failed to provide support for the belongingness hypothesis in this study.

Study 1 established the factor structure and nomological network of the GCES. Our next goal was to further establish the criterion validity of the GCES. Study 2 examines GCES-S scores and observer ratings of photographs in a sample known to be high in geek engagement: geek convention attendees.

Study 2

In order to validate the GCES in the population for which it was intended, we gave the GCES-S as well as measures of narcissism and self-esteem to attendees at the 2013 meeting of Dragon*Con. If the GCES is a valid measure of geek engagement, we expect attendees at a major geek convention to score significantly higher on average than participants in non-geek specific populations (e.g., Samples A and B from MTurk). In addition, we wanted to further validate geek engagement as a construct by testing whether it was observable to naïve strangers. Studies have shown that outside observers can accurately perceive individual difference variables from photographs, (Naumann, Vazire, Rentfrow, & Gosling, 2009) especially when the

subject of the photograph has some control over the picture (e.g., pose, outfit, smile). If geek

engagement is a valid construct, we can expect individuals higher in geek engagement to appear

"geekier" than individuals lower in geek engagement in photos. Therefore, we took a photograph

of each participant to examine whether observers' perceptions of their appearance are consistent

with their geek engagement score. Because narcissism can also be perceived through appearance

(Naumann, Vazire, Retfrow, & Gosling, 2009), we also tested whether observers' perceptions of

their appearance are consistent with the hypothesized relationship between geek engagement and

narcissism.

Methods

Procedure

Participants (N = 202) were approached in downtown Atlanta, GA during the

Dragon*Con geek convention. The researchers targeted persons wearing badges indicating they

were attendees of the convention. Participants were informed as to the purpose of the study, gave

consent by signing a consent form, and completed two pages of brief surveys. Then, with the

participants' consent, their picture was taken using a digital camera. Participants were given no

specific instructions as to how to pose or whether to smile. They received no compensation for

their participation.

Materials

Geek engagement. The short form of the Geek Culture Engagement Scale (GCES-S; α =

.79) created in Study 1 was used in Study 2. The GCES-S is a 14-item index of engagement in

geek interests and activities. Participants indicated their engagement in each geek activity on a

scale from 1 (*not at all)* to 5 (*very much)*. Due to a typographical error, about 50% of participants

failed to rate the item Renaissance Fairs; however, this does not appear to have significantly affected the reliability of the full scale (α with Renfaires omitted = .79).

      Grandiose narcissism. In order to reduce the burden of participation, we used a six item version of the Narcissistic Personality Inventory (NPI). Only the two highest loading questions on each factor of the Ackerman Split (Ackerman et al., 2011) for the NPI-13 (Gentile et al., 2013) were used. The composite of these items showed an α of .73.

      Self-esteem. Again in the interest of time, the Single Item Self-Esteem Scale (Robins, Hendin, & Trzesniewski, 2001), consisting of the item "I see myself as someone who has high self-esteem," was used. Participants endorsed this item on a Likert scale from 1 (*strongly disagree*) to 5 (*strongly agree*).

      Photo ratings. Photos of study participants were rated on three sets of criteria. All raters were members of our undergraduate research team at a large southeastern university. Each member of the team provided only one set of ratings, i.e., geek engagement raters were independent from subjective raters and the appearance rater.

      Appearance ratings were obtained to examine whether individuals high in geek engagement differed appreciably in appearance, demeanor, or dress from those low in geek engagement. These ratings were assigned by a single rater and included ratings from Vazire and colleagues (2008) as well as five additional items pertaining to costuming (i.e., "Does the person appear to be feminine (vs. masculine)?"; "Is the person wearing a costume?"; "Is the person wearing a t-shirt with a logo?; "Is the person striking a pose?"; and "Is the person smiling?"). These five items reflected either ways individuals could transmit their geek identity specifically (i.e., broadcasting their knowledge/devotion (Woo, 2012) to or conspicuous consumption of

(McArthur, 2008) a geek topic by wearing a costume or logo t-shirt) or basic appearance cues we felt were not adequately covered by Vazire and colleagues' (2008) ratings. The rater was instructed to focus on the person wearing the costume, rather than the character they were attempting to portray. The rater endorsed each item on a scale from 1 (*not at all*) to 5 (*very much*).

Geek Engagement ratings were obtained to see if trained observers can discern geek engagement and interests from outward appearance. These were assigned by five raters trained by the experimenter who received information on geek culture, fashion, and genres. Raters scored each picture on a scale from 1 (*not at all)* to 5 (*very much)* as to how much the participant appeared to hold each interest listed on the GCES-S, resulting in 20 scores for each picture. These scores were averaged to produce a Geek Engagement rating score. Intraclass correlations were above or close to .7 for LARP, Scifi, Anime, Manga, and Furry, and above .8 for Lolita. The rest were at or below .6.

Subjective ratings were obtained to examine the raters' impressions of each participant's personality and social status independent of their geek engagement. These were assigned by three raters who were given no instruction or background on geek culture. Participants endorsed ten items (i.e., "How narcissistic is this person?"; How geeky is this person overall?"; "How high is this person's self-esteem?"; "How likeable is this person?"; "How self-centered is this person?"; "How attractive is this person?", "How much social status does this person have?"; "How intelligent is this person?"; "How kind is this person?"; and "How caring is this person?") on a Likert scale from 1 (*not at all)* to 5 (*very much*) for each picture. Intraclass correlations were above or close to .7 for Geeky, Self-Esteem, Attractive, and Social Status. The rest were at or below .6.

Results

Average geek engagement

The mean GCES-S for conference attendees (M = 2.70, SD = .77) was significantly

higher than both Sample A (M = 2.11, SD = .70), t(201) = 10.93, p < .001, d = .80, and Sample B

(M = 1.76, SD = .76), t(201) = 17.36, p < .001, d = 1.22, from Study 1.

Zero-order correlations and regression

Zero-order correlations replicated findings from Study 1, with geek engagement related

positively to narcissism, r(200) = .18, 95% CI [.04,.31], and unrelated to self-esteem, r(200) = -

.17, 95% CI [-.30,.03]. In a multiple linear regression predicting geek engagement with gender,

age, socioeconomic status, narcissism, and self-esteem, only age, narcissism, and self-esteem

maintained significance. This further supports the findings of Study 1 in that age, narcissism, and

self-esteem still predict geek engagement after controlling for gender or SES.

Appearance ratings

As seen in Tables 15 and 16, overall geek engagement was associated with wearing a

costume, eyeglasses and makeup, and with putting a lot of preparation into ones appearance.

Because these ratings included several items expected to differ by gender (e.g., femininity,

makeup, cleavage), correlations were examined separately for both males and females, as well as

for the full sample. Participants were classified as either male or female exclusively through self-

report (i.e., they chose either the item "Male" or the item "Female" on our survey). Among

women, higher geek engagement was associated with wearing a costume and makeup, striking a

pose, being muscular and having put a lot of preparation into one's appearance. Also among

Table 15. Correlations between Appearance Ratings of Dragon*Con Photographs and Self-Esteem, Narcissism, and Geek Engagement. Note: 95% Confidence intervals in brackets. Confidence intervals not containing 0 in bold.

	Feminine	Costume	Logo	Pose	Smiling
			Full Sample		
Self-Esteem	-.01	-.06	-.08	.08	**.14**
	[-.15,.13]	[-.20,.08]	[-.22,.06]	[-.06,.22]	**[.01,.28]**
Narcissism	.02	-.04	-.07	**.15**	.10
	[-.12,.15]	[-.17,.10]	[-.21,.07]	**[.02,.29]**	[-.04,.23]
Geek	.05	**.16**	-.06	.13	-.03
Engagement	[-.08,.19]	**[.02,.29]**	[-.19,.08]	[-.01,.26]	[-.16,.11]
			Men		
Self-Esteem	.07	.05	-.13	.19	.08
	[-.13,.26]	[-.14,.25]	[-.32,.07]	[-.01,.37]	[-.12,.27]
Narcissism	-.05	-.13	-.08	.02	.06
	[-.24,.15]	[-.32,.07]	[-.27,.12]	[-.18,.22]	[-.14,.25]
Geek	.15	.10	**-.25**	.04	-.04
Engagement	[-.05,.34]	[-.09,.30]	**[-.43,-.06]**	[-.16,.24]	[-.23,.16]
			Women		
Self-Esteem	.08	-.11	-.07	-.07	**.26**
	[-.12,.27]	[-.30,.09]	[-.27,.13]	[-.26,.13]	**[.07,.44]**
Narcissism	**.20**	.07	-.07	**.24**	.18
	[.01,.39]	[-.13,.27]	[-.27,.12]	**[.05,.42]**	[-.02,.37]
Geek	.13	**.24**	.17	**.23**	-.01
Engagement	[-.07,.32]	**[.04,.42]**	[-.03,.35]	**[.04,.41]**	[-.21,.18]

women, narcissism was associated with striking a pose and appearing feminine, while self-esteem was associated with appearing cheerful. Among men, higher geek engagement was negatively associated with wearing a t-shirt with a logo.

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Table 16. Correlations between Ratings of Dragon*Con photographs Based on Vazire et al. (2008) and Self-esteem, Narcissism, and Geek Engagement. Note: 95% Confidence intervals in brackets. Confidence intervals not containing 0 in bold. SE = Self-esteem, N = Narcissism, and GE = Geek Engagement.

	Fashionable	Stylish	Expensive	Plain	Organized	Neat	Cheerful	Preparation	Make up	Eye glasses	Muscular	Skin
						Full Sample						
SE	.09	.07	.04	.11	.01	-.03	.13	-.04	.03	.03	.06	.09
	[-.05,.23]	[-.07,.20]	[-.10,.18]	[-.03,.24]	[-.13,.14]	[-.17,.10]	[.00,.27]	[-.17,.10]	[-.10,.17]	[-.10,.17]	[-.07,.20]	[-.05,.23]
N	.08	.09	.04	-.03	-.08	-.01	.08	-.07	-.01	-.01	.06	.08
	[-.06,.22]	[-.05,.22]	[-.10,.17]	[-.17,.10]	[-.22,.06]	[-.15,.13]	[-.06,.21]	[-.21,.06]	[-.15,.13]	[-.15,.13]	[-.07,.20]	[-.06,.22]
GE	-.13	-.08	.07	-.08	-.13	.11	-.06	**.17**	**.21**	**.21**	-.02	-.13
	[-.26,.01]	[-.22,.06]	[-.07,.20]	[-.22,.05]	[-.26,.01]	[-.03,.24]	[-.19,.08]	**[.03,.30]**	**[.08,.34]**	**[.08,.34]**	[-.15,.12]	[-.26,.01]
						Men						
SE	.02	.04	.11	.12	.01	-.12	.05	.02	.07	.05	-.04	.11
	[-.18,.22]	[-.15,.24]	[-.09,.30]	[-.08,.31]	[-.19,.20]	[-.31,.08]	[-.15,.24]	[-.18,.21]	[-.13,.26]	[-.15,.24]	[-.24,.16]	[-.09,.30]
N	.09	.09	.12	.04	-.09	.00	.00	-.08	-.02	.01	.10	**.24**
	[-.11,.28]	[-.11,.28]	[-.08,.31]	[-.15,.24]	[-.28,.11]	[-.20,.19]	[-.20,.20]	[-.27,.12]	[-.22,.17]	[-.19,.20]	[-.10,.29]	**[.04,.42]**
GE	-.10	-.10	.16	.01	-.08	.11	-.11	.11	.16	.05	-.13	-.15
	[-.29,.10]	[-.29,.10]	[-.03,.35]	[-.19,.20]	[-.27,.12]	[-.09,.30]	[-.30,.09]	[-.09,.30]	[-.04,.34]	[-.14,.25]	[-.32,.07]	[-.33,.05]
						Women						
SE	.15	.09	.01	.08	-.01	.05	**.23**	-.03	.02	-.06	-.09	.18
	[-.05,.33]	[-.11,.28]	[-.19,.21]	[-.11,.28]	[-.20,.19]	[-.15,.25]	**[.04,.41]**	[-.23,.17]	[-.17,.22]	[-.26,.14]	[-.28,.11]	[-.02,.36]
N	.07	.11	.02	-.11	-.03	-.06	.17	-.03	.02	-.03	.00	-.01
	[-.13,.27]	[-.09,.30]	[-.18,.22]	[-.30,.09]	[-.23,.16]	[-.25,.14]	[-.02,.36]	[-.23,.17]	[-.18,.22]	[-.23,.17]	[-.20,.20]	[-.20,.19]
GE	-.16	-.07	-.01	-.18	-.19	.11	-.02	**.26**	**.27**	-.02	**.24**	.13
	[-.35,.03]	[-.27,.13]	[-.21,.19]	[-.37,.01]	[-.37,.01]	[-.09,.30]	[-.21,.18]	**[.07,.44]**	**[.08,.45]**	[-.22,.18]	**[.05,.42]**	[-.07,.32]

Geek engagement ratings

The average of observer ratings of the GCES-S items was negatively related to self-reports, $r(200) = -.15$, 95% CI [-.28,-.01]. Relationships between subscale scores and ratings can be found online at https://osf.io/u25x9/.

Subjective ratings

Judges' ratings of narcissism, $r(200) = .16$, 95% CI [.02,.29], and self-centeredness, $r(200) = .19$, 95% CI [.05,.32], correlated positively with self-reports of narcissism, and ratings of self-esteem correlated positively with self-reported self-esteem, $r(200) = .17$, 95% CI [.03,.30], supporting the validity of these judges' ratings. To the judges, individuals highest in geek engagement were seen as significantly more "geeky" as subjectively defined by the rater $r(200) = .23$, 95% CI [.10,.36].

Discussion

Attendees at Dragon*Con scored significantly higher on geek engagement than our previous two samples, further supporting the validity of the GCES-S. Although judges were accurately able to discern narcissism and self-esteem from appearance, they were unable to accurately assess geek engagement from photographs. These results imply that geek engagement as quantified by the GCES is not readily apparent from one's physical appearance within the limited range of attendees at a geek convention. This may result from a possible difficulty in discerning differences among people of very high geek engagement, as a sample of individuals at a geek convention may present a restriction of range in geek engagement. However, a different set of judges were able to discern "geekiness" as they subjectively defined it which correlated positively with self-reported GCES scores. This highlights the utility of the GCES for quantifying what may only subjectively be discerned by trained observers.

Consistent with the great fantasy migration hypothesis, we again saw higher narcissism associated with higher self-reported geek engagement. However, although participants with high geek engagement appeared to have put more preparation in their appearance and women high in geek engagement wore more makeup (both of which can be signs of narcissism; Vazire et al., 2008), these ratings were not themselves associated with self-reported narcissism, suggesting that these ratings (along with the rest of the Vazire et al. ratings) may not be valid cues of narcissism in geek populations..

In Studies 1 and 2 we have established that self-reported engagement in geek activities relates consistently to several individual differences variables. The relationship between geek engagement and narcissism is consistent with the great fantasy migration hypothesis; however, the core of this hypothesis is that individuals high in narcissism are escaping unsatisfactory engagement in real life by engaging in fantasy themed activities. In Study 3 we explore whether engagment in geek culture is associated with less engagement in civic activities and planning for the future. We predict a tradeoff in that the more time and resources an individual has devoted to geek activities (i.e., the more migrated the individual is), the less time and resources he or she will have available to engage in civic behavior or show concern about his or her future. We thus predicted a negative relationship between geek engagement and civic engagement as well as future orientation.

Study 3

In Studies 1 and 2, engagement in geek culture activities related positively to narcissism. These results provide preliminary support for the great fantasy migration hypothesis, which predicts that persons high in narcissism may migrate to the fantasy worlds provided in geek culture, and thus become less engaged in real life activities. We further examined this hypothesis

by measuring geek culture engagement, life goals, and civic engagement in a sample of normal adults to test whether geek cultural engagement would be associated with less civic engagement and lower interest in life goals pertaining to career, family, and political achievement. We also tested whether geek engagement was associated with lower future orientation—we predicted that individuals showing less engagement with real life would also show less concern for the future and potential consequences of their actions.

Methods

Procedure and Materials

Again, participants (N = 348) indicated their consent by clicking "I consent" on a consent script and completed the measures via an online survey hosting website before being compensated via MTurk. The same generic posting was used as in Study 1 Sample B. We used the GCES (α=.93) and NPI (α=.89) described in previous studies.

Life Goals

Participants endorsed 34 items (see Table 7) from Monitoring the Future (Bachman, Johnston, & O'Malley, 1978) as used in Twenge, Campbell, and Freeman (2012) on a scale from 1 (*not important*) to 4 (*extremely important*). Items included a range of potential life goals such as family (e.g., "Having a good marriage and family life"), activist (e.g., "Participating in a community action program"), financial (e.g., "Having lots of money"), and recreational (e.g., "Having plenty of time for recreation and hobbies") goals.

Civic engagement

The 25 items used by Jennings and Zeitner (2003) formed our measure of civic engagement. Participants reported their media usage on a scale from 1 (*not at all*) to 4 (*almost daily*), indicated their involvement in political campaigns and civic organizations (e.g., church,

labor unions, political groups, sports teams) via yes/no questions, demonstrated political knowledge through a brief test, and answered several multiple choice questions concerning their trust in others and in the government.

Future orientation

The Future Orientation Scale (FOS; Steinberg et al., 2009) is a 15-item measure of the tendency to attend to and plan for future consequences. Participants were given 15 pairs of opposing statements (e.g. "Some people like to plan things out one step at a time," "Other people like to jump right into things without planning them beforehand") and both chose a statement and rated that statement as either "*really true for me*" or "*sort of true for me.*" In addition to the full scale score (α = .83), the FOS has three subscale scores: Planning Ahead (α = .71), Time Perspective (α = .60), and Anticipation of Future Consequences (α = .70).

Results

Narcissism

As with the previous studies, narcissism was again correlated positively with geek engagement, $r(347)$ = .30, 95% CI [.19,.41]. In addition, narcissism was marginally positively related to media awareness, $r(347)$ = .11, 95% CI [.00,.22], positively related to political trust, $r(347)$ = .20, 95% CI [.09,.31], and engagement in civic organizations, $r(347)$ = .13, 95% CI [.02,.24], but negatively correlated with political behavior, $r(347)$ = -.16, 95% CI [-.27,-.05] and civic knowledge, $r(347)$ = -.16, 95% CI [-.27, -.05]. Narcissism was unrelated to future orientation, $r(347)$ = -.08, 95% CI [-.19, .03].

Life goals

The link between geek culture engagement and life goals was mixed. As seen in Table 17, individuals high in geek engagement endorsed items reflecting a desire for power or status (e.g., "Having administrative responsibility over the work of others," "Becoming an authority in my field," "Influencing the political structure"), career advancement (e.g., "Becoming successful in a business of my own"), activism or humanitarian concerns (e.g., "Helping to promote racial understanding," "Working to correct social and economic inequalities"), sensation seeking (e.g., "Discovering new ways of experiencing things," "Getting away from this area of the country") and artistic pursuits (e.g., "Becoming accomplished in one of the performing arts"). However, in a series of multiple regressions predicting each life goal with geek engagement, future orientation, narcissism, age, gender, and SES, geek engagement no longer predicted the life goals "Being a leader in my community," "Having lots of money," "Working to correct social and economic inequalities," "Keeping up to date with political affairs," "Having administrative responsibility over the work of others." "Becoming a community leader," "Obtaining recognition from my colleagues for my contributions to my special field," and "Becoming an authority in my field." The majority of these items (i.e., items pertaining to leadership, status, and recognition) were most likely related to geek engagement through narcissism.

Items reflecting family goals were either unrelated (e.g., "Raising a family," "Having a good marriage and family life") or negatively related (e.g., "Being close to parents and relatives") to geek engagement. Geek engagement was also unrelated to the desire for meaning (e.g., "Developing a meaningful philosophy of life," "Finding purpose and meaning in my life").

Civic engagement

As seen in Table 6, individuals high in geek engagement appear to participate in civic organizations and have high trust in the government, but show less political knowledge and are markedly less involved in the political process (campaigns, voting, etc.). In a series of multiple regressions predicting each index with age, gender, SES, geek engagement, narcissism, and future orientation, geek engagement no longer predicted political knowledge. These results indicate some disengagement from political behavior but not from other forms of civic behavior, such as special interest groups and activism. Individuals higher in geek engagement were significantly more likely to hold membership in neighborhood associations, $r[347] = .16$, 95% CI [.05,.26], nonpartisan groups, $r[347] = .13$, 95% CI [.03,.23], ethnic, racial, or nationality associations, $r[347] = .22$, 95% CI [.11,.31], support or self-help groups, $r[347] = .13$, 95% CI [.03,.23], and music or art groups $r[347] = .23$, 95% CI [.13,.33].

Future orientation

Geek engagement did not show a significant association with future orientation, $r(347) = -.07$, 95% CI [-.17,.05], nor with its subscales Planning Ahead, $r[347] = -.10$, 95% CI [-.20,.01], Time Perspective, $r[347] = .03$, 95% CI [-.08,.13], and Anticipation of Consequences, $r[347] = -.07$, 95% CI [-.17,.04].

Discussion

Overall, the results of this study are inconsistent with the civic engagement aspects of the great fantasy migration hypothesis. There was a positive association with narcissism. Likewise, geek engagement was associated with disengagement from political behavior and family oriented goals. However, high geek engagement scores are still positively associated with many other life goals and participation in non-political civic organizations, suggesting higher civic engagement

Table 17. Correlations between Geek Engagement and Life Goals Items from Twenge, Campbell, & Freeman (2012) and Civic Engagement Scores. Note: 95% Confidence intervals in brackets. Confidence intervals not containing 0 in bold.

	Geek Engagement		Geek Engagement		Geek Engagement
1. Finding purpose and meaning in my life.	-.04 [-.14,.07]	1. Being very well off financially.	.08 [-.03,.18]	15. Becoming accomplished in one of the performing arts (i.e. acting, dancing)	**.40** **[.31,.48]**
2. Being a leader in my community.	**.25** **[.14,.34]**	2. Developing a meaningful philosophy of life.	.08 [-.03,.18]	16. Influencing the political structure.	**.33** **[.24,.43]**
3. Being close to parents and relatives.	**-.13** **[-.23,-.03]**	3. Keeping up to date with political affairs.	**.12** **[.02,.22]**	17. Becoming successful in a business of my own.	**.22** **[.11,.31]**
4. Being able to find steady work.	-.05 [-.15,.06]	4. Having administrative responsibility for the work of others.	**.27** **[.17,.36]**	18. Helping others who are in difficulty.	.07 [-.04,.17]
5. Having strong friendships.	.01 [-.10,.11]	5. Becoming involved in programs to clean up the environment.	**.29** **[.19,.38]**	19. Writing original works (i.e. poems, novels, short stories)	**.37** **[.27,.46]**
6. Having a good marriage and family life.	**-.14** **[-.24,-.03]**	6. Becoming a community leader.	**.25** **[.14,.34]**	20. Creating Artistic Work	**.27** **[.17,.37]**
7. Having lots of money.	**.12** **[.01,.22]**	7. Raising a family.	-.07 [-.17,.04]	Media Awareness	.07 [-.04,.17]
8. Working to correct social and economic inequalities.	**.18** **[.07,.28]**	8. Obtaining recognition from my colleagues for my contributions to my special field.	**.18** **[.08,.28]**	Political Behavior	**-.27** **[-.37,-.17]**
9. Discovering new ways of experiencing things.	**.22** **[.12,.32]**	9. Participating in an organization like the Peace Corps or Americorps/VISTA.	**.37** **[.28,.46]**	Political Trust	**.33** **[.24,.42]**
10. Being able to give my children better opportunities than I've had.	-.06 [-.17,.04]	10. Influencing social values.	**.23** **[.13,.33]**	Social Trust	-.05 [-.15,.06]
11. Being successful in my line of work.	.08 [-.02,.18]	11. Becoming an authority in my field.	**.25** **[.14,.34]**	Civic Organizations	**.20** **[.10,.30]**
12. Having plenty of time for recreation and hobbies.	.01 [-.10,.11]	12. Making a theoretical contribution to science.	**.36** **[.27,.45]**	Civic Knowledge	**-.12** **[-.22,-.01]**
13. Making a contribution to society.	.03 [-.07,.14]	13. Participating in a community action program.	**.25** **[.15,.35]**		
14. Getting away from this area of the country.	**.26** **[.16,.35]**	14. Helping to promote racial understanding.	**.25** **[.15,.34]**		

in most areas for geeks. Although many of the civic groups reported (e.g., self-help, ethnic and nationality organizations) appear unlikely to be geek related, it is possible that geek organizations, such as volunteering at conventions or geeky art or musical groups, provide more opportunities for geeks to be engaged. In addition, geek engagement was unrelated to future orientation. This may be because geeks are equally future oriented toward their geek behavior as non-geeks are to real life, or it may reflect normal engagement with real life. Together these results suggest that although narcissism continues to reliably predict geek engagement, the aspects of the great fantasy migration that predict reduced engagement in real life need to be revised.

Studies 1 through 3 focused on the great fantasy migration hypothesis. Although we found some supporting evidence for this hypothesis, geek behavior may be influenced by other processes as well. Studies 4 and 5 will examine the belongingness hypothesis. We predict that individuals engage in geek culture because they believe it will fulfill their needs for belongingness. In Study 4, we examine belongingness needs as a motivation to both engage in geek behavior and to identify with geek culture. We predicted that individuals who anticipated acceptance from others when engaging in geek behaviors would be more likely to identify as a geek and to engage in geek behavior than individuals who did not. We thus predicted a positive relationship between geek engagement and geek identity.

Study 4

The goals of Study 4 are twofold. First, we tested the belongingness hypothesis through an adaptation of Leary et al.'s (1995) belongingness paradigm. Participants rated each activity from the GCES in terms of how they would feel when they participated in the activity as well as how they believed others would react to them. Based on Sociometer Theory (Leary, 1995),

participants will report feeling higher self-esteem and more positive feelings when performing

activities that they believe would lead others to accept them. If the belongingness hypothesis

holds true, higher geek involvement will be associated with believing others who are important

to them would accept them for engaging in geek activities and with feeling more positively when

engaging in the same activities.

Second, we sought to further validate the GCES by measuring its relationship to reported

geek behaviors (e.g., LARPs and conventions attended, role-playing games played) and to geek

identity. To accomplish the latter, we developed the Geek Identity Scale (GIS), a brief measure

of the extent to which one identifies as a geek and as part of geek culture. We predicted that

higher scores on the GCES would be associated with higher frequency of geek behaviors and

higher scores on the GIS.

Method

Participants and procedure

Participants (N = 334) indicated their consent by clicking "I consent" on a consent script

and completed the measures via an online survey hosting website before being compensated via

MTurk.The same generic posting was used as in Study 1, Sample B.

Materials

Geek culture engagement and behaviors. The full 37-item GCES was used for this

study. The scale showed a Cronbach's α of .91. We also asked participants to quantify how often

they engaged in each of the activities or lifestyles listed. Participants responded to 39 questions

with how often they engaged in each activity in either the last day, week, month, or year,

depending on the activity. Time frame was contingent on the availability of the behavior (e.g.,

one can spend several hours on internet forums a day but can only attend so many conventions in

a year).

Geek identity. Participants responded to the Geek Identity Scale (GIS)—ten questions

measuring whether they identified as a geek and saw participation in geek culture as part of their

identity. The full GIS can be found in the appendix. Questions were on a Likert scale (1 =

Strongly Disagree; 5 = *Strongly Agree*) and showed a Cronbach's α of .97.

Belongingness. Consistent with Leary et al. [69], participants rated the geek behaviors

mentioned above five times: first, how they felt "the people important in their life" would react

to them if they engaged in that activity (1 = *many other people would reject or avoid me*; 5 =

many other people would accept or include me) and then how they imagine they would feel if

they engaged in the activity on four dimensions (bad/good, ashamed/proud, worthless/valuable,

and dejected/happy). Each dimension was rated on a 5-point scale with 1 indicating the negative

emotion and 5 indicating the positive.

Results

Geek activities and identity

To assess whether Geek Engagement was associated with self-identification as a geek

and geek behavior, we correlated each GCES activity with the self-reported frequency of

performing that activity, as well as with the summed GIS scores. Consistent with our predictions,

each activity or lifestyle listed in the GCES positively predicted the frequency of engaging in

that activity or lifestyle (see Table 18) and full scale GCES score significantly predicted the

frequency of engaging in each activity or lifestyle (r's = .11-.45). In addition, full scale GIS

score positively predicted geek engagement, $r(333) = .47$, 95% CI [.38, .55], confirming that

those high in geek engagement are more likely to explicitly identify as a geek. Finally, we split

the sample into specialists who reported high engagement in only one or two geek activities (N =

128) and generalists who engaged in three or more geek activities (N = 141). Specialists (M =

2.55) scored significantly lower in geek identity than generalists (M = 3.32), t(140) = 8.52, p <

.001, further supporting our conception of geek identity as being higher when individuals engage

in more geek activities.

Belongingness

To assess whether engagement in geek activities was associated with belongingness

motives, we correlated the reject me/accept me rating for each item on the GCES with the

feelings ratings for that activity (e.g., the reject me/accept me rating for Comic Books was

correlated with the bad/good, ashamed/proud, worthless/valuable, and dejected/happy ratings for

Comic Books). This was done instead of the within-person correlation analysis performed by

Leary and colleagues (1995) in order to simplify the analyses. For all geek behaviors listed, the

extent to which participants expected those important in their lives to accept vs. reject them for

performing each activity positively predicted whether they would feel good vs. bad (rs = .36-

.65), proud vs. ashamed (rs = .25-.61), valuable vs. worthless (rs = .27-.61) and happy vs.

dejected (rs = .30-.67). We also correlated each GCES activity with the corresponding reject

me/accept me rating to see whether engagement in that activity was associated with expected

acceptance or rejection. The degree to which participants expected those important in their lives

to accept them for performing each activity positively predicted the frequency of their engaging

in that activity (rs = .11-.36) with the exception of LARPing, theater, use of social networking

sites, BDSM, and participation in live casts of the *Rocky Horror Picture Show*. Finally, we

computed an average of the accept me/reject me ratings as an index of anticipated acceptance of

	Geek Engagement		Geek Engagement		Geek Engagement
LARP events per mo.	**.45** [.36,.53]	Hours spent participating in theater per year	.11 [.00,.22]	Hours spent Filking per mo.	**.21** [.10,.31]
Table Top Role Playing Game sessions per mo.	**.42** [.33,.50]	Hours spent on Creative Writing per mo.	**.14** [.03,.24]	Hours spent watching Cinema per mo.	**.35** [.25,.44]
Hours spent Computer/Console Gaming per mo.	**.25** [.15,.35]	Hours spent on Social Networking websites per week	**.22** [.11,.32]	Hours spent watching Joss Whedon series per mo	**.37** [.27,.46]
Hours spent on Cosplay per mo.	**.36** [.26,.45]	Hours spent on Fantasy-themed activities per mo.	**.35** [.26,.44]	Showings of the Rocky Horror Picture Show participated in per year	**.35** [.25,.44]
Hours spent posting in internet forums per week	**.18** [.08,.28]	Hours spent on Sci-Fi themed activities per mo.	**.36** [.27,.45]	Meetings of Skeptic societies attended per year	**.41** [.32,.49]
Conventions attended per year	**.42** [.33,.50]	Hours spent watching Anime per mo.	**.21** [.11,.31]	Hours spent participating in the Lolita lifestyle per mo.	**.24** [.13,.34]
Renaissance fairs attended per year	**.44** [.35,.53]	Hours spent reading Manga per mo.	**.21** [.10,.31]	Hours spent participating in the Goth/Punk Rock lifestyle per mo.	**.30** [.20,.39]
SCA and other historical reenactment events attended per year	**.37** [.27,.46]	Hours spent reading or trading Comic Books per mo.	**.36** [.26,.45]	Hours spent participating in the Furry (anthro, etc.) lifestyle per mo.	**.29** [.19,.39]
Hours spent on weapons collecting per mo.	**.16** [.05,.26]	Hours spent on Horror themed activities per mo.	**.17** [.06,.27]	Hours spent participating in the Pagan (i.e., Wiccan, Norse, etc.) religion per mo.	**.22** [.12,.32]
Hours devoted to paranormal Investigation per mo.	**.26** [.16,.36]	Hours spent watching, listening to or acting in Broadway Musicals per mo.	**.24** [.13,.33]	Hours spent practicing BDSM per mo.	**.38** [.28,.47]
Hours spent on puppetry per mo.	**.29** [.19,.38]	Hours spent on Alternative History-themed activities per mo.	**.37** [.27,.46]	How many BDSM/kink events attended per year	**.40** [.31,.49]
Hours spent on robotics per mo.	**.12** [.02,.23]	Hours spent watching non-Anime Animation per mo.	**.19** [.09,.29]	Polyamorous (consentually nonmonogamous) relationships	**.28** [.18,.38]
Hours spent learning about robotics per mo.	**.21** [.10,.31]	Hours spent watching British Series per mo.	.11 [.00,.22]	Polyamorous relationship partners	**.21** [.10,.31]

Table 18. Correlations between Geek Engagement and Frequency of Geek Activities. Note: 95% Confidence intervals in brackets. Confidence intervals not containing 0 in bold.

others when engaging in geek activities. This average was positively related to geek identity, $r(333) = .26$, 95% CI [.16, .36], suggesting that belongingness motives are associated with having a stronger geek identity.

Discussion

People appear to have positive self-feelings when engaging in geek activities to the extent that they expect important people in their life to accept them for doing so. In addition, people appear to identify more strongly as a geek when they expect others to accept them for engaging in geek activities. Although these data cannot establish causation, they are not inconsistent with the hypothesis that people engage in geek activities and identify with geek culture at least in part because of belongingness motives.

In addition, the GCES significantly predicts greater reported frequency of geek behaviors as well as greater identification as a geek. These findings support the criterion validity of the GCES in that GCES scores predict actual behavior and self-identification as a geek. In addition, the relationship between geek engagement and geek identity imply that geek culture includes a source of personal identity, consistent with Social Identity Theory (Tajfel & Turner, 1979) and that identification as a geek increases as engagement in more geek activities increases. Future research should examine the implications of this identity, including but not limited to whether geek identity implies identifying as an outsider with reference to mainstream culture and whether there is stigma associated with this identity. However, such hypotheses are beyond the scope of this paper.

Study 4 provides support for the belongingness hypothesis by showing engagement in geek culture is positively related to the belief that others will accept them for doing so. Study 5 tests the prediction that individuals who engage in geek culture will have stronger friendship ties with individuals who are similarly engaged, especially with regard to specific geek interests, than with those who do not share geek interests.

<div align="center">**Study 5**</div>

The belongingness hypothesis proposes that individuals engaging in geek activities form ties with others through those activities. Based on this hypothesis, we would expect to see geeks naming predominately other geeks as members of their social networks, and for their strongest ties to be with others who share their same specific geek interests (e.g., hobbies with hobbies, lifestyles with lifestyles). In Study 5, we conducted a social network analysis of the egocentric networks of a sample of normal adults on MTurk. Participants nominated up to 30 of the people closest to them and rated those persons on each of the subscales of the GCES. We predicted strong homophily among geeks—that geeks' social networks would consist primarily of others with similar geek engagement scores, and that among high scoring geeks their ties would be closest with those who shared similar obscure interests.

Methods

Procedure

The same posting used to target geeks in Study 1, Sample A was used to recruit participants on Amazon MTurk. Participants (N = 181) indicated their consent by clicking "I consent" on a consent script and completed the measures via an online survey hosting website before being compensated via MTurk.

Materials

In addition to the GCES (α = .91) participants reported egocentric network data, with each participant (ego) instructed to report 30 friends and family who are important in their lives (alters). The number 30 was chosen because it has been shown to be the optimal number of alters needed to accurately discern the nature of the network (McCarty, Killworth, & Rennell, 2007) However, 45.7% of the sample did not comply with this instruction and listed less than 30 alters. These participants listed an average of 9.23 alters each. Participants also rated each alter's engagement in each subscale of the GCES on a scale from 1 (*not at all*) to 5 (*very much*). Finally, participants answered questions about the relationships among their alters. Each alter pairing was rated on a scale ranging from 1 (*strangers*) to 3 (*very close*).

Results

Social network parameters: Density, degree centrality

Density and degree centrality scores were calculated for each ego's network using UCINET software (Radloff, 1977). The ego's geek culture engagement scores were then correlated to these measures. Density reflects the proportion of the number and strength of connections in a network to the total number and strength of connections possible. The higher the density score, the more strong connections are present. Geek engagement was not significantly correlated to density, showing that individuals engaged in geek culture were not more likely to have interrelated networks where everyone knows everyone else. Degree centrality reflects the degree to which any one or few alters are central, or a connecting point, for many other alters in the network. Geek engagement was not related to degree centrality, showing that those high in geek engagement were not more likely to be central in their social networks.

Homophily analyses

Homophily between each ego and his or her alters was calculated by correlating the ego's geek engagement score with the average geek engagement score of his or her network. As seen in Table 8, significant zero-order correlations suggested a strong homophily between all geeks regardless of specific interests. Because the facets of the GCES (see Study 1) are strongly correlated with one another, we also ran a series of regressions controlling for shared variance between the subscales. Table 19 shows the same relationships as Table 8 when controlling for shared variance between subscales. These data show a clear pattern of homophily between geeks who share the same interests in all subscales of the GCES with the exception of hobbies. In addition, strong homophily remained between individuals who share interests that may be compatible, (e.g., roleplaying and theater).

Discussion

The results of Study 5 appear to support the belongingness hypothesis. Geeks appear to form the strongest ties with those sharing similar specific geek interests, but also are more likely to form strong ties with other geeks who have similar interests. Although these results should be interpreted with caution due to noncompliance issues (i.e., the majority of participants not listing the requested number of alters), this general geek homophily is consistent with past research conceptualizing geek culture as using geek interests as social currency (Woo, 2012a). Future research should examine whether this homophily results from shared norms, beliefs, and values between the different fandoms in geek culture.

Table 19. Correlations between Ego Geek Scores and the Average Geek Scores of their Networks.

Note: 95% Confidence intervals in brackets. Confidence intervals containing 0 in bold.

Ego Scores	Lifestyles Avg	Genres Avg	Hobbies Avg	Japanese Avg	Theater Avg	Role Playing Avg	Puppetry Robotics Avg	Geek Engagement Avg
Lifestyles	**.53**	**.38**	**.27**	**.42**	**.38**	**.34**	**.36**	**.51**
	[.42,.63]	**[.25,.50]**	**[.12,.40]**	**[.29,.53]**	**[.24,.49]**	**[.20,.46]**	**[.23,.48]**	**[.39,.61]**
Genres	.10	**.38**	**.33**	.18	.19	.06	.04	.24
	[-.05,.24]	**[.24,.49]**	**[.19,.45]**	[.03,.32]	[.05,.33]	[-.09,.20]	[-.11,.18]	[.10,.37]
Hobbies	**.45**	**.39**	**.32**	**.41**	**.38**	**.41**	**.36**	**.53**
	[.33,.56]	**[.26,.51]**	**[.18,.44]**	**[.28,.52]**	**[.25,.50]**	**[.28,.52]**	**[.23,.49]**	**[.41,.62]**
Japanese	**.41**	**.43**	**.20**	**.56**	**.30**	**.31**	**.26**	**.47**
	[.28,.52]	**[.31,.55]**	**[.06,.34]**	**[.45,.65]**	**[.16,.42]**	**[.17,.44]**	**[.12,.39]**	**[.35,.58]**
Theater	**.30**	**.37**	**.34**	**.28**	**.47**	**.20**	**.25**	**.42**
	[.17,.43]	**[.23,.49]**	**[.20,.46]**	**[.14,.41]**	**[.35,.57]**	**[.06,.34]**	**[.10,.38]**	**[.29,.53]**
Role Playing	**.45**	**.29**	**.29**	**.30**	**.36**	**.54**	**.33**	**.48**
	[.32,.56]	**[.16,.42]**	**[.15,.42]**	**[.17,.43]**	**[.22,.48]**	**[.42,.63]**	**[.20,.46]**	**[.36,.58]**
Puppetry Robotics	**.36**	**.30**	**.16**	**.36**	**.40**	**.34**	**.42**	**.42**
	[.23,.48]	**[.16,.42]**	**[.01,.30]**	**[.22,.48]**	**[.27,.52]**	**[.20,.46]**	**[.29,.53]**	**[.30,.54]**
Geek Engagement	**.50**	**.50**	**.39**	**.47**	**.48**	**.39**	**.37**	**.59**
	[.38,.60]	**[.38,.60]**	**[.26,.51]**	**[.35,.58]**	**[.36,.58]**	**[.26,.51]**	**[.24,.49]**	**[.49,.68]**

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Table 20. Beta Coefficients between Ego Geek Scores and the Average Geek Scores of their Networks Controlling for Correlation

Between Subscales. Note: 95% Confidence intervals in brackets. Confidence intervals not containing 0 in bold.

Ego Scores	Lifestyles Avg	Genres Avg	Hobbies Avg	Japanese Avg	Theater Avg	Role Playing Avg	Puppetry Robotics Avg
Lifestyles	**.37**	**.18**	.11	**.16**	.09	.09	.13
	[.24,.49]	**[.03,.32]**	[-.04,.25]	**[.01,.30]**	[-.06,.23]	[-.06,.23]	[-.02,.27]
Genres	-.06	**.24**	**.23**	-.01	-.04	-.06	-.09
	[-.20,.09]	**[.09,.37]**	**[.09,.37]**	[-.16,.14]	[-.19,.10]	[-.21,.08]	[-.23,.06]
Hobbies	-.07	-.01	.06	.02	-.14	.01	.03
	[-.21,.08]	[-.15,.14]	[-.09,.20]	[-.12,.17]	[-.28,.01]	[-.14,.16]	[-.11,.18]
Japanese	**.19**	**.22**	-.02	**.44**	.07	.13	.05
Theater	**[.05,.33]**	**[.08,.36]**	[-.16,.13]	**[.32,.55]**	[-.07,.22]	[-.02,.27]	[-.09,.20]
	-.01	.04	.10	-.03	**.35**	-.09	.02
	[-.15,.14]	[-.11,.18]	[-.05,.24]	[-.17,.12]	**[.22,.48]**	[-.23,.06]	[-.13,.17]
Role Playing	**.26**	.06	**.16**	.04	**.16**	**.46**	.12
	[.11,.39]	[-.08,.21]	**[.02,.30]**	[-.11,.18]	**[.01,.30]**	**[.34,.57]**	[-.03,.26]
Puppetry Robotics	.03	.03	-.08	.07	**.19**	.07	**.26**
	[-.12,.17]	[-.11,.18]	[-.22,.07]	[-.07,.22]	**[.04,.32]**	[-.08,.21]	**[.12,.39]**

Studies 1 through 5 focused on the great fantasy migration and belongingness hypotheses. In Studies 6 and 7, we turned our attention to our third hypothesis, the need for engagement hypothesis, which proposes that individuals high in need for stimulation and creative outlets (i.e., individuals high in need for cognition, intelligence, openness, creativity, and sensation seeking) would be more likely to engage in geek culture.

Study 6

In Study 6 we measured intelligence, fantasy proneness, and several known predictors of creativity (e.g., schizotypal personality and dissociative traits) along with geek culture engagement in a general sample of adults.

Positive associations between the immersive aspects of geek culture engagement and fantasy proneness would be consistent with the great fantasy migration hypothesis. We predicted that individuals who have functional levels of fantasy proneness would be more likely to engage in geek culture because of its fantasy-themed content in geek activities. Positive associations between geek culture engagement and fantasy proneness, crystallized and fluid intelligence, need for cognition, and sensation seeking would be consistent with the need for engagement hypothesis. Because many fan groups distinguish themselves as having more active engagement with their media (e.g., Whiteman, 2009), we predicted geeks would be individuals who had higher need for intellectual (e.g., need for cognition) and emotional (e.g., sensation seeking) stimulation.

Methods

  Participants and procedure

  Again, participants (N = 226) indicated their consent by clicking "I consent" on a consent script and completed the measures via an online survey hosting website before being compensated via MTurk. The same generic posting was used as in Study 1, Sample B.

  Materials

  In addition to the GCES (α = .94), NPI (α = .91) and Five Factor model checklist (N [α = .77] E [α = .70] O [α = .68] A [α = .68] C [α = .81]) we included the following measures.

  Fantasy proneness. The Creative Experiences Questionnaire (CEQ; Merckelbach, Horselenberg, & Muris, 2001) is a 25-item measure of fantasy prone personality (α = .85). Participants answered a series of yes/no questions (e.g., "I prefer watching educational to entertainment programs") about their fantasies, magical beliefs, and childhood experiences. The total number of "yes" answers indicated their level of fantasy proneness.

  Dissociative experiences. The Dissociative Experiences Questionnaire (DEQ; Bernstein, & Putnam, 1986) is a 27-item measure of dissociative symptomology (α = .95). Participants indicated through a sliding scale what percentage of the time they experience each item (e.g., "Some people have the experience of looking in a mirror and not recognizing themselves") in their daily lives.

  Schizotypal personality. The Schizotypal Questionnaire (STQ; Claridge & Broks, 1984) is a 37-item measure of schizotypal personality (α = .92). Participants answered yes/no questions such as "Do you believe in telepathy?" and "Do you feel it is safer to trust nobody?" The total number of "yes" answers indicated their level of schizotypal symptomology.

Intelligence. General intelligence has been shown to be made up of two main factors, crystallized intelligence (or accumulated knowledge) and fluid intelligence (ability to work with information). Intelligence is best assessed by measuring both factors (Flanagan, Ortiz, & Alfonso, 2013). The Shipley Institute of Living Scale (Shipley, 1940) is a brief self-administered measure of both crystallized and fluid intelligence. The crystallized subscale consists of 40 vocabulary terms of increasing difficulty. Participants chose a synonym from four answer choices for each term. The fluid subscale consists of 20 pattern recognition items. Participants discerned the relationship between the numbers, letters, or words in each item and provided the next item in the series. For both subscales, we used the number of correct answers as their intelligence score.

Need for cognition. The Need for Cognition scale (NFC; Cacioppo & Petty, 1982) is a 34-item measure ($\alpha = .95$) of need for cognition, or the tendency to take pleasure in thinking for its own sake. Participants rated statements such as "I really enjoy a task that involves coming up with new solutions to problems" on a Likert-type scale from -4 (*very strong disagreement*) to +4 (*very strong agreement*). Because of computer error, item 5 was omitted from the NFC scale. However, it appears to show excellent reliability.

Sensation seeking. The Sensation Seeking Scale (SSS; Zuckerman, Kolin, Price, & Zoob, 1964) consists of 34 forced-choice items ($\alpha = .82$). Participants chose between statements such as "I prefer friends who are excitingly unpredictable" versus "I prefer friends who are reliable and predictable." The number of sensation seeking choices made comprised the participants' total score.

Results

      We assessed relationships between all variables using zero-order correlations and linear regressions. Geek engagement continued to be positively related to narcissism, $r(226) = .24$, 95% CI [.11,.36], neuroticism, $r(226) = .23$, 95% CI [.10, .35], and openness to experience, $r(226) = .28$, 95% CI [.16,.40]. Consistent with the great fantasy migration and desire for engagement hypotheses, geek engagement was also positively related to fantasy proneness, $r(226) = .49$, 95% CI [.39,.58], dissociative symptoms, $r(226) = .59$, 95% CI [.49,.67], and schizotypal personality, $r(226) = .40$, 95% CI [.29,.51]. Likewise, geek engagement was positively associated with sensation seeking, $r(226) = .32$, 95% [.20,.43], supporting the assertion that individuals more in need of stimulation tend to engage more strongly in geek culture. In contrast, geek engagement was negatively related to fluid intelligence, $r(226) = -.17$, 95% CI [-.30,-.04], and crystallized intelligence, $r(226) = -.29$, 95% CI [-.40,-.16], and unrelated to need for cognition.

      Due to high intercorrelation between the constructs in this study (rs = .25-.70), we tested the relationship between geek engagement and intelligence, need for cognition, sensation seeking, schizotypal personality and dissociation in separate regressions along with age, gender, SES, and the Big Five personality traits. Sensation seeking and fluid intelligence ceased to be significant predictors of geek engagement when controlling for these variables.

      Thus overall support for the desire for engagement hypothesis was mixed – there was high openness but lower intellectual ability in this sample.

Discussion

      The results of Study 6 suggest that those individuals most engaged in geek culture are more likely to report traits associated with narcissism, openness, neuroticism, and fantasy proneness, and have tendencies toward dissociation and schizotypal personality , but have lower

crystallized intelligence than individuals lower in geek engagement. This pattern is consistent with the great fantasy migration hypothesis, but only partially consistent with the desire for engagement hypothesis, as geek engagement showed strong relationships with those constructs related to creativity (i.e., fantasy proneness, openness, dissociation and schizotypy) but not those related to intellectual and emotional stimulation (i.e., need for cognition and sensation seeking) when controlling for demographics and personality. This suggests those engaged in geek culture only need engagement in terms of creative outlets, rather than stimulation. In addition, the negative relationship with crystallized intelligence, although persistent when controlling for demographic variables, needs more research to be fully understood. The Shipley uses a vocabulary test as a proxy for crystallized intelligence. This may reflect reduced education or reduced verbal ability rather than reduced cognitive ability. More research with a more in depth intelligence scale is warranted.

In addition to the traits measured in Study 6, the need for engagement hypothesis predicts that creative individuals may be more likely to engage in geek culture. Study 7 examines this prediction.

Study 7

Another individual difference variable associated with need for engagement is creativity. Creative people are often said to require stimulation and novelty (Martindale, 1999), and in addition to having stimulating and novel themes (e.g., fantasy, science fiction) geek culture activities (such as constructing costumes, writing storylines for role playing games, and portraying popular characters through cosplay) offer a plethora of creative outlets. In Study 7, we measured geek culture engagement along with several aspects of creativity including values and attitudes toward creativity, creative activities and behaviors, and the generation of ideas. Because

we had not yet measured education in regards to geek engagement, we also included education in our demographics for this study. A positive relationship between geek engagement and creativity would be consistent with the desire for engagement hypothesis.

Methods

Procedure

Again, participants (N = 396) indicated their consent by clicking "I consent" on a consent script and completed the measures via an online survey hosting website before being compensated via MTurk. The same generic posting was used as in Study 1, Sample B.

Materials

In addition to the GCES (α=.91) and the GIS (α= .96), individuals were asked to indicate their level of education on a scale from 1 (*less than a high school diploma*) to 5 (*Ph.D. and beyond)* and three scales from the Runco Creativity Assessment Battery (rCAB; Runco & Jaeger, 2011) were used to assess behavioral, ideational, and attitudinal aspects of creativity. These scales are as follows:

Creative behavior. The Creative Activity Checklist is a 65-item list (α = .98) of creative activities and accomplishments (i.e., "Remixed music on a computer," "Designed a website"). Participants indicated whether they have engaged in each activity (a) never (b) *once* in school or work as an assignment (c) *more than once* in school or work (d) *once* on their own or (e) *more than once* on their own. Participants receive two scores: school or work (α = .97) and on their own (α = .97).

The generation of ideas. The Runco Ideational Behavior Scale Short Form (RIBS-S; α =
.83) is a 19-item scale designed to measure the frequency with which one generates original
ideas. Participants rated how often items such as "I hear songs and think of different or better
lyrics" and "I have ideas for making my work easier" describe them on a 5-point scale (0 =
Never to 4 = *Daily*).

Attitudes toward creativity. The Attitudes and Values Scale (α = .75) is a 25-item scale
designed to measure attitudes and values related to creativity. Participants endorsed items such as
"Sometimes it is best to be unconventional" and "Time is often wasted when everyone involved
on a project shares each of his or her ideas (reversed)" on a 5-point scale (1 = *Strongly Disagree*;
5 = *Strongly Agree*).

Results

We assessed all relationships using zero-order correlations. Education level was unrelated
to geek engagement, $r(394) = -.08$, 95% CI [-.18, .01]. Individuals higher in geek engagement
showed significantly more creative behavior both in school, $r(394) = .24$, 95% CI [.14,.33], and
on their own, $r(394) = .25$, 95% CI [.16,.34], ideational behavior, $r(394) = .39$, 95% CI [.30,.47],
and more positive attitudes toward creativity , $r(394) = .12$, 95% CI [.02,.21]. Thus, individuals
high in geek engagement report having more ideas, feel compelled to do more creative projects,
and value creativity and its products more than individuals low in geek engagement. In addition,
individuals who scored higher in geek identity showed significantly more ideational behavior,
$r(394) = .25$, 95% CI [.15,.34], positive attitudes toward creativity, $r(394) = .14$, 95% CI
[.04,.23], and creative behavior both in school, $r(394) = .18$, 95% CI [.08,.27], and on their own,
$r(394) = .15$, 95% CI [.05,.24].

Again, due to some intercorrelation between the creativity indices (rs = .03-.33), we ran a separate regression predicting geek engagement with each individual index along with gender, age, SES, and education. All creativity indexes continued to significantly predict geek engagement, while age and social class significantly predicted geek engagement and education marginally predicted geek engagement.

Thus, individuals with high geek engagement not only engaged in opportunities to be creative in work or school, where they may have been encouraged or even made to do so, but also undertook creative endeavors on their own time and of their own accord.

Discussion

The results of Study 7 provide further support for the desire for engagement hypothesis in that those higher in geek engagement seem to hold positive attitudes toward creativity and engage in more creative activity in general. Identification as a geek was also tied to creative attitudes and behaviors, suggesting that creativity is an acknowledged part of geek culture and considered part of the geek stereotype.

<div align="center">An Internal Meta-Analysis</div>

To make the results more clear, we meta-analyzed results collected in more than one sample and present them in Figure 9. Over the course of five studies, narcissism showed a consistently strong positive relationship to geek engagement, $r(2353) = .24$, 95% CI [.19, .29]. This relationship persisted after controlling for age, gender, SES, and in Study 7, education. We can say with high confidence that geek engagement is positively related to narcissism, which provides partial support for the great fantasy migration hypothesis. Hypersensitive narcissism, entitlement, depression and subjective well-being all showed relationships consistently above zero over the course of two studies, whereas the Big Five traits of openness, neuroticism, and

extraversion showed average relationships above zero over the course of three studies. However, in Studies 1 and 6, the majority of these relationships went away when controlling for gender age, and SES. Only openness, depression, and SWB maintained significance in Study 1, and openness maintained significance in Study 6 except when fantasy proneness and schizotypal personality were controlled for. The consistency with which these patterns of results appear over multiple studies suggest that the higher a person's geek engagement, the higher their narcissism,openness, depression, and self-reported subjective well-being. In addition, we meta-analyzed the relationship between the GCES item "real life" and full scale geek engagement as a further test of the great fantasy migration hypothesis. This item showed a consistent negative relationship with geek engagement, suggesting that geeks may perceive themselves as less engaged in their daily lives. However, because we provided little guidance as to definition of real (daily) life, and because of the specificity of geek engagement relative to "real life," this relationship may also reflect differing definitions of "real life" rather than actual disengagement. Further research is required to determine whether this lack in felt engagement is specific to geek engagement.

General Discussion

As recently as the 1980's, comic book heroes, high fantasy, and science fiction—media interests typically associated with geeks—were considered strange, unpopular, and in many cases taboo. In 2014, these same markers of geek culture are box office smashes, multi-billion dollar industries, and a wide-reaching counterculture with its own brands, fashion trends, and celebrities.
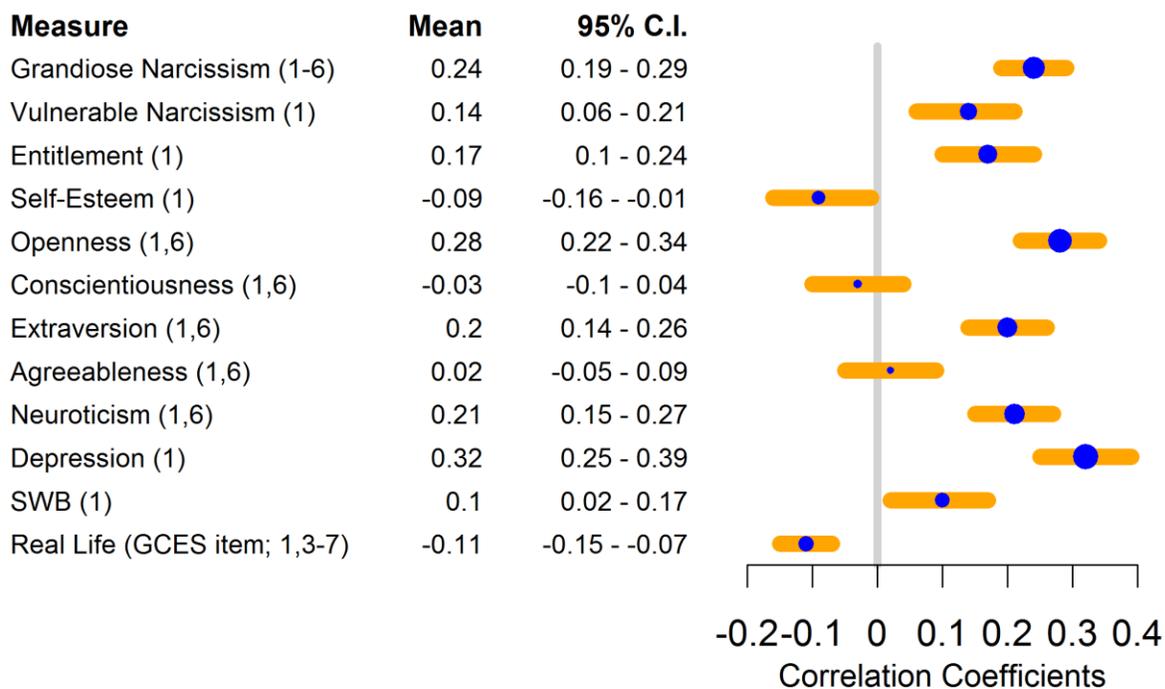
Measure	Mean	95% C.I.
Grandiose Narcissism (1-6)	0.24	0.19 - 0.29
Vulnerable Narcissism (1)	0.14	0.06 - 0.21
Entitlement (1)	0.17	0.1 - 0.24
Self-Esteem (1)	-0.09	-0.16 - -0.01
Openness (1,6)	0.28	0.22 - 0.34
Conscientiousness (1,6)	-0.03	-0.1 - 0.04
Extraversion (1,6)	0.2	0.14 - 0.26
Agreeableness (1,6)	0.02	-0.05 - 0.09
Neuroticism (1,6)	0.21	0.15 - 0.27
Depression (1)	0.32	0.25 - 0.39
SWB (1)	0.1	0.02 - 0.17
Real Life (GCES item; 1,3-7)	-0.11	-0.15 - -0.07

Figure 9. Forest plot of average correlations across studies for selected individual differences variables.

We sought to better understand the phenomenon of geek culture primarily at the individual level—that is, to understand why a given individual would choose to engage in geek culture. We developed and validated two scales to measure two major components of geek culture: engagement and identity. We also proposed and found mixed evidence for each of three models of geek cultural engagement. We review these findings below.

The Geek Culture Engagement Scale (GCES) and the Geek Identity Scale (GIS)

The GCES is the first measure of its kind to focus specifically on the geek subculture. The GCES shows excellent reliability and construct validity. It adequately distinguishes self-identified populations (e.g., Dragon*Con attendees) and correlates positively with actual

behavior (Study 3). It captures nuances of geek engagement that are not apparent to naïve observers (Study 2). Despite several of its factors having only two items, it presents a stable factor structure, with the majority of its subscales showing appropriate reliability. The possible exceptions are the Puppetry/Robotics and Roleplaying subscales—despite their face validity, these subscales contain only two items and show relatively low correlations. However, these subscale scores remain correlated to the other subscales and to geek engagement as a whole, and inclusion of their items in the full scale score does little to harm the overall reliability of this measure.

There are important limitations to the interpretations that can be drawn from the GCES. First, because we used major geek conventions to generate the list of activities for the scale, this scale may fail to capture more marginalized geek activities that are not represented at a large convention. Second, because we conceptualized geek culture engagement as involvement in multiple geek activities, this scale may not capture geek "specialists," or persons engaging intensely in only one geek activity (e.g., an avid Trekkie who only devotes his time to *Star Trek*). Although specialists were relatively rare in our samples, they did appear to differ from other geeks in terms of Big Five personality variables—especially agreeableness, where specialists reported relatively low levels. Thus, the GCES speaks best to generalist geeks, and caution should be used when specifically studying specialist geeks. However, homophily between geeks with specific interests (Study 5) only emerged when controlling for intercorrelation between subscales, and the Geek Identity Scale (GIS) correlates positively with the full scale GCES, implying that identification as a geek intensifies as one is engaged in more and more geek

activities. Although geek specialists may exist, these persons may identify less with geek culture per se, and identify more strongly with their chosen fandom, as evidenced by their lower overall score on geek identity.

The GIS also shows excellent internal consistency and reliability across samples as a measure of identification with the geek subculture. Together, these two scales may capture the majority of geek behavior, but more work should be done to measure geek obsessiveness, which may be important in distinguishing higher levels of geek engagement, and more cultural aspects, such as social currency, systems of meaning, and social norms. We now review the specific hypotheses.

The "Great Fantasy Migration" Hypothesis

Studies 1, 2, 3, and 6 addressed the great fantasy migration hypothesis, which predicts that individuals high in narcissism and fantasy proneness will engage in the immersive aspects of geek culture at the expense of engagement in real life in order to live out grandiose fantasies. In support of this hypothesis, we find a positive correlation between narcissism and geek engagement, as well as a positive correlation between geek engagement and fantasy proneness (see Fig. 1). The item "real life" also shows a consistent inverse relationship with engagement in geek culture. Less consistent with the hypothesis, the results of Study 3 do not support a negative association between geek culture and broader engagement with civic society. Although they showed slight disengagement from political behavior and more trust in the government, those high in geek engagement were more likely to value career, financial, and activist goals, showing greater engagement in their own lives. Thus, we found mixed evidence for the great fantasy migration hypothesis. It may be that narcissistic individuals are indeed engaging more in geek activities, but are still able to remain engaged in their life goals and in civic organizations that are

not involved in politics. In a sense, then, geek culture might be an additional outlet for narcissism but not the only one used by individuals. Ultimately, these data provide only a snapshot of geek and real life engagement at one point in time. In order to thoroughly test the great fantasy migration hypothesis, longitudinal data is needed to determine whether depression or negative events at one point in time leads to greater geek engagement at a later point in time, which then leads to reduced engagement in real life events still later. Whether those high in geek engagement also continue to experience the negative effects of failure in real life (e.g., lower self-esteem and subjective well-being) when engaged in geek culture should also be explored. Geek engagement showed a significant positive relationship to depression across several studies after controlling for demographic variables, suggesting that at the time of the survey, at least, individuals high in geek engagement felt depressed.

The Belongingness Hypothesis

Studies 1, 4, and 5 addressed the belongingness hypothesis, which predicts that individuals will engage in geek culture to fulfill belongingness needs. Belongingness has long been considered a basic need (Baumeister & Leary, 1995) and Self-Determination Theory (Deci & Ryan, 1980) posits that much of human motivation is driven by basic needs related to belongingness (e.g., relatedness). Study 1 provided little support for this hypothesis, as the relationships subscale of the BPN scale showed no relationship to geek engagement. This implies that those high in geek engagement are neither more nor less likely to have fulfilled their belongingness needs than those who are low in geek engagement. However, in Study 4, whether participants expected to be accepted or rejected by others for participating in geek activities significantly predicted both their self-directed emotions and actual engagement in each activity.

Study 5 addressed the social networking facet of this hypothesis: specifically, individuals engaging in geek activities form ties with others through those activities. Although there was no correlation between geek engagement and network size, density, or centrality, we found distinct evidence of homophily between persons with similar geek engagement scores. This homophily was most pronounced with persons of similar specific geek interests (e.g., Scifi/Fantasy, Roleplaying). While homophily (Mcpherson, Smith-lovin, & Cook, 2001) is a well-known phenomenon in multiple domains (e.g. people tend to connect to others who are similar in demographics such as race or SES, personality traits, and beliefs or values), our findings are inconsistent with the stereotype of geeks as loners and social outcasts who engage in geek activities in private (Tocci, 2009). However, whether geeks are finding others with similar interests or introducing their already geeky friends to their specific geek interests can only be tested with a longitudinal study. Another drawback of these data is that they rely on the self-report of a single individual within each network. A social network analysis in which each member of the network provides information on him or herself would be desirable to confirm homophily between geeks.

In sum, those high in geek engagement are more likely to have closer relationships with others who share their specific geek interests, although they are no more likely to have large or dense networks of friends or to be central to their network of friends than those low in geek engagement. They experience positive self-feelings when engaging in geek activities to the extent that they feel those important in their lives will accept them for engaging in these activities, but they do not show thwarted belongingness needs. The results of these three studies can be reconciled if one does not consider geek engagement to be a guaranteed means of fulfilling belongingness needs. Perhaps people engage in geek activities partly with the

(conscious or unconscious) goal to achieve belongingness; however, whether they actually succeed may differ depending on the individual. Conversely, fulfilled belongingness may be a byproduct of engaging in geek culture for other reasons, but provides additional reinforcement to continue engaging. Further research that directly assesses the motivations of those engaging in geek culture is needed to fully understand this process.

The Desire for Engagement Hypothesis

Studies 1, 6 and 7 addressed the desire for engagement hypothesis. This hypothesis suggests that geek engagement will be highest among people who crave emotional and intellectual stimulation, such as those high in openness to experience, creativity, intelligence, need for cognition, and sensation seeking. After controlling for demographic variables, geek engagement was significantly related to openness to experience, fantasy proneness, schizotypal personality and dissociation, all known predictors of creativity. In addition, geek engagement was associated not only with creative behavior, but also ideational behavior and positive attitudes toward creativity, although we did not measure the quality of their creative ideas and products. However, geek engagement showed a negative relationship to crystallized intelligence. This is inconsistent with the commonly held belief that geeks are more intelligent than non-geeks. Overall, although geeks do not appear to particularly need emotional or intellectual stimulation, they require outlets for their creativity, although they may lack intellectual ability and may or may not be creatively talented.

Our predictions were only partially supported with regards to the openness, creativity, and need for stimulation correlated with geek engagement. Of the variables tested, geek engagement appears to be predicted primarily through creativity and its correlates. Neither need for cognition nor sensation seeking appear to play a role. In addition, the negative relationship

with crystallized intelligence conflicts with the common belief that geeks are more intelligent than non-geeks. This may partially be a result of using a brief self-report scale of intelligence. Although the Shipley Institute of Living Scale (Shipley, 1940) is a well-established brief measure of intelligence, a more in-depth IQ battery such as the WAIS-IV (Wechsler, 2008) may be needed to detect more nuanced relationships between geek engagement and intelligence. Although surprising, geek engagement's negative relationship with intelligence coupled with its positive relationships to dissociative and schizotypal symptoms are consistent with DeYoung, Grazioplene, & Peterson's (2012) conception of openness to experience as a paradoxical simplex in which intelligence and apophenia (a trait similar to schizotypy) are both related to openness but also different from each other. These results suggest that those who are high in geek engagement are on the apophenia (rather than intelligence) region of the simplex. This could explain the common belief that geeks are more intelligent because their openness resembles that of individuals high in the intellect region of the circumplex. However, their tendency toward apothenia may determine why some individuals high in openness gravitate toward geek activities while others do not.

A Neuroticism Hypothesis?

We did not predict any relationship with geek engagement and neuroticism or related constructs (e.g., depression) in any of our models. However, the data show a consistent relationship between geek engagement and neuroticism and nonclinical depression as measured by the CES-D (*r*'s around .22). Part of this (as shown in Study 1) might be a consequence of age and gender, because when these were covaried the neuroticism correlations dropped to contain zero in the confidence interval. But there are several other possible explanations. For example, geek engagement could be attractive to people who are depressive because it might serve an

emotion regulatory function – basically an escape from unpleasant experiences. Likewise, geek engagement could lead to depression or neuroticism because it isolates one from the mainstream culture and real life. This latter explanation, however, seems unlikely given that our data show geek engagement provides a source of belongingness and does not impair most forms of civic engagement. Also, in Sample B of Study 1, the autonomy subscale of the BPN and the autonomy and impersonal subscales of the GCOS related to geek engagement in such a way as to suggest thwarted autonomy needs and reduced feelings of effectiveness and intrinsic motivation. Individuals who feel ineffective and controlled in real life (and thus may suffer from reduced well-being and depression) may increase their well-being through geek activities that support autonomy. This would be consistent with the leisure coping research more broadly (Iwasaki, & Mannell (2000). These findings contrast with the consistent positive relationship between geek engagement and subjective well-being. Clearly, more work needs to be done on these issues – and it may be that these reflect alternate streams of the "great fantasy migration" (i.e., escaping mainstream cultural negativity and autonomy-thwarting environments) or, in the case of neuroticism, an additional motivation for the belongingness hypothesis (i.e., an effort to use geek cultural engagement to reduce neuroticism by increasing belongingness). Research examining whether depression and related constructs are reduced and autonomy is increased during engagement in geek activities can further illuminate this issue.

Ethical Interpretation of Findings

We are aware that several of our findings have the potential to create or perpetuate social stigma for individuals in geek culture. It is not our intention to link geek culture with dysfunction or antisocial behavior. Although the terms narcissism, fantasy proneness, schizotypy, and dissociation are often used in clinical contexts, the field has moved toward viewing these

constructs as dimensional traits, moderate levels of which may be neutral or even adaptive for the individual (e.g., O'Connor & Dyce, 2001). Narcissism in particular has been studied as an adaptive trait by social psychologists (Sedikides, Rudich, Gregg, Kumashiro, & Rusbult, 2004; Hill & Yousey, 1998) and moderate levels of schizotypal personality and dissociation have been shown to be related to creativity (Miller & Tal, 2007; Schuldberg, 2001), which can be a form of adaptive functioning. A subfactor resembling schizotypy has been found in the basic personality trait openness to experience (DeYoung et al., 2012) and fantasy proneness includes a nonclinical factor that encompasses daydreaming and enjoyment of fantasy (Klinger et al., 2009). Therefore, relationships between these traits and geek engagement should not be interpreted as evidence of psychopathology in geeks. Individuals high in geek engagement in Studies 1-7 above scored high in all of these traits, but barring some depression, reduced crystalized intelligence, and thwarted autonomy, they also showed increased levels of civic engagement and showed no deficits in belongingness, social network size, or future orientation. Thus we have painted a picture of geeks as different, but not dysfunctional.

Limitations and Future Directions

In this paper we have only begun to explore the reasons people engage in geek culture. As we state up front, this is a beginning rather than the last word on the topic. We have relied heavily (although not exclusively) on correlational, self-report data to examine the plausibility of the theories posed above. Experimental, developmental or experience sampling methods would be ideal to more definitively test each of the hypotheses proposed in this paper. We have foregone more complex mediational analyses that will eventually be required to provide a definitive test of the mechanisms we have proposed here. We also have not conducted research using other ethusiasts as a comparison group; research comparing geeks to other groups

containing like-minded individuals (e.g., football fans) will be needed to determine whether these relationships are exclusive to geeks. Finally, we have focused on these hypotheses at an individual level. Cultural level work exploring major cultural events and demographic information is needed to examine these hypotheses, as geek engagement is a cultural trend as well as an individual behavior.

In addition, there is a strong reliance on MTurk as the source for most of the samples used (with the exception of our sample from Dragon*Con). Although there is little reason to expect MTurkers to differ appreciably from the wider population (Buhrmester et al., 2011), use of a wider range of samples in future work would be useful.

Finally, even within geek engagement, more work needs to be done to discern what makes these media interests part of geek culture. For example, what role does escapism play in geek culture? Is escapism the common factor that attracts geeks to a new franchise? Does the appeal lie in some element of "magic" or controlling the uncontrollable? Do the media need to include some sort of "special" individual who has extraordinary powers or has been chosen for some quest? Additionally, geeks are theorized to share social norms, values, and customs in addition to common interests (Twenge et al., 2008; Putnam, 2001; Woo, 2012). Work using techniques from cultural psychology or sociology may help to illuminate these elements of geek culture.

Conclusion

Although it primarily concerns entertainment and leisure, geek culture is becoming an increasingly prevalent part of our society. The study of geek culture can tell us much about how individuals engage with media and for what reasons. Our findings suggest that geek media is especially attractive to narcissists, independent of demographic variables. Given the trend of

rising narcissism in the United States (Twenge et al., 2008), understanding geek media may shed light on the function media plays in the narcissistic process. We have also found geek engagement to be related to subclinical depression, making it potentially relevant to clinical psychologists as either a cause or a potential remedy for depressed mood. The GCES and GIS can be used to do important work on each of these social problems.

This paper has taken the first steps toward defining and measuring geek engagement, and has proposed and explored several explanations for its popularity. In addition, this paper takes a unique approach to examining subcultural trends through a personality and individual differences perspective. Much of the past research on group membership has focused on groups in which membership is less freely chosen (e.g., racial and ethnic cultures), but the current research focuses on voluntary participation in a counter culture. This approach has the advantage of targeting in the self-selecting natures of subcultures (for example, how does the greater majority of fantasy prone white males in geek culture affect the norms of that culture?) and may prove helpful in examining future phenomena at both an individual and cultural level. We hope to have laid some useful groundwork for future research exploring such phenomena and their impact on recent generations.

CHAPTER 5

DISCUSSION

In Chapter 1, I proposed that virtual worlds—such as social media, gaming, and immersive virtual reality—afford the regulation of narcissism for their users in ways physical reality does not. Broadly, the findings described in the last three chapters support this statement in the following ways:

1) There is ample evidence that those high in grandiose narcissism use social media (Chapters 2 and 3) and fantasy (Geek) media (Chapter 4) more often and more intensely than those low in grandiose narcissism. There is some evidence that this is true of vulnerable narcissism as well.

2) There is evidence that those high in grandiose and vulnerable narcissism report emotions and motivations when taking selfies that are consistent with using the affordances of selfies for self-enhancement (Chapter 3).

3) There is evidence that those high in grandiose narcissism who are also high in extraversion, openness, and fantasy proneness and low in neuroticism (traits associated with the ability to experience presence) are more likely to use fantasy media.

The above evidence suggests that individuals in need of narcissistic supply may prefer virtual worlds to physical worlds, and that they at least expect to receive reinforcement of their grandiose self-views from these worlds. It implies that different features of virtual worlds may appeal to individuals high in different forms of narcissism, who have different needs in terms of

self-regulation. However, this work falls short of fully establishing that virtual worlds in fact afford the regulation of narcissism. In order to draw this conclusion, several questions must first be answered. In the following sections, I will address these limitations, as well as suggest research that can further illuminate the role of virtuality in narcissism regulation. Finally, I will discuss a new concept that arises naturally from the current work: that the increasing adjacency of real and virtual worlds in modern times affords a new form of narcissism regulation—the self-serving virtuality bias.

Limitations and Directions for Future Research

Do Narcissism and Affordances Interact to Predict the Use of Virtual Worlds to Self-Enhance?

One major limitation of the above research is that although many of the concepts presented, such as that of affordances (Evans et al., 2012), are described as interactive, but interaction models have not been tested. In Chapter 4, the authors demonstrate that both grandiose narcissism and the tendency to experience presence (i.e., high scores in extraversion, openness to experience, and fantasy proneness; Weibel, Wissmath, & Mast, 2010) are linked to increased use of the fantasy worlds provided by geek media. However, it is not established whether these effects are additive or interactive in predicting geek engagement. The Great Fantasy Migration (GFM) hypothesis of the same chapter also predicts an interaction between narcissism and decreased opportunities for narcissism regulation in the physical world in predicting virtual migration. Weiler (2017) provides a further test of this hypothesis, finding that narcissism and a combination of pessimism and mistrust/hopelessness interact to predict virtual

migration. Although this provides added support for the GFM, this still only implies that ndividuals high in narcissism turn to virtual worlds when that narcissism is thwarted; whether they expect or receive self-enhancement from said worlds is left untested.

In order to better test the hypothesis that virtual worlds afford self-enhancement for those high in narcissism, two questions must be explored: 1) does narcissism interact with specific features of virtual worlds to predict virtual world usage? and 2) does this interaction actually result in self-enhancement? Chapters 2 and 3 move toward answering question 1 by showing that those high in narcissism use specific features of social media that have the potential for self-enhancement (e.g., selfies, status updates) more often or more intensely than those low in narcissism. However, this work simply assumes self-enhancement is happening whenever these features are used, and the correlation between narcissism and social media use is decreasing over time as social media use becomes more normative (see Chapter 2). Other literature (e.g., Buffardi & Campbell, 2008; Barry et al., 2015; DeWall et al., 2011) moves toward answering question 2 by showing more frequent self-enhancing content (e.g., flattering photos, "I" and "me" words in status updates) on social media to be associated with narcissism. However, no studies have directly addressed the interaction between narcissism and specific features of virtual worlds in predicting self-enhancing content. Does the searchability of photos interact with narcissistic motives to predict more selfies displaying abs, bikini bodies, or luxury fashion? Does the anonymity of a video game avatar interact with narcissism levels to predict choosing a more high-powered, over-the-top character (such as an elf warrior) versus a more modest, communally oriented character (such as a hobbit healer)? Ideally, these questions should be explored with an

experimental paradigm using ego threat to induce the need for self-enhancement; however, comparing measurements of personality and self-enhancing behaviors across platforms differing in the feature of interest would also add significantly to our understanding.

Does the Construct of Narcissism Manifest the Same Way in Virtual Worlds?

The second major limitation of the above research (and of research on virtual worlds in general) is the assumption that narcissism and self-enhancement manifest and are experienced the same way in virtual worlds as they are in the physical world. Although I argued in Chapter 1 that virtual experiences are regarded as at least somewhat real, the degree to which they resemble physical experiences is not clear. Studies show that virtual environments, particularly those that can realistically simulate physical experience such as IVEs, can stimulate direct learning through conditioning and the modification of mental models (Tamborini & Bowman, 2010). However, Snell (2017) found invariance in the basic five-factor structure of self-reported personality (McRae & Costa, 1999) between real and self-selected virtual environments. In virtual environments, a four-factor model in which extraversion and openness were magnified better fit the data. This suggests that narcissism may not exist in virtual worlds the way we know it in the physical world, and that the ways we measure narcissism in the physical world may not translate to virtual environments. Much work needs to be done to clarify how narcissism manifests in virtual worlds. A replication of Snell's work can examine whether the NPI maintains its structure in virtual spaces, and many seminal works on narcissism could be replicated within virtual spaces to see if the results differ. Particular attention can be directed toward whether individuals high in narcissism reap the benefits of self-enhancing behavior in virtual spaces—do they show increased well-being (Sedikides et al., 2004) and decreased availability of shame schemas

(Horvath & Morf, 2009) after self-enhancing in a virtual space? Do self-enhancing behaviors done in virtual worlds count as much as real life behaviors, or is one in-person compliment worth a thousand Facebook likes?

In large part, the degree to which virtual experiences resemble physical experiences in their effects depends on how "real" one regards the experience, as well as the opinions of society as a whole. For example, in the earliest days of the internet, friendships and relationships formed online were largely regarded as inauthentic, whereas such interactions are more likely seen as equivalent to in-person friendships today. As our lives become more fully integrated with technology, the lines between the physical and the virtual will no doubt blur even more, but at present we live in a time where we may still have some choice in how seriously we take our experiences in virtual spaces. I argue that this ambiguous environment provides us with a unique meta-affordance when it comes to self-enhancement: the self-serving virtuality bias.

The Self-Serving Virtuality Bias

The motivation to defend one's self-esteem, even in individuals with lower narcissism, has a significant impact on cognition and behavior. People have been shown to employ cognitive biases in order to protect their self-esteem from threats such as negative feedback, rejection, and failure. For example, people tend to attribute the causes of positive events to their own traits or efforts, while they attribute the causes of negative events to outside forces, such as circumstances, other people, or temporary handicaps (for a review, see Mezulis, Abramson, Hyde, & Hankin, 2004). They tend to recall more of their positive behaviors than negative ones (Klein & Kunda, 1993) and have a harder time attributing negative traits to themselves than to others (Brown, 1986; Tabachnik, Crocker, & Alloy, 1983). They focus on comparing themselves

to individuals they perceive as inferior to boost positive self-feelings (Wills, 1981). And the current trend of blending real and virtual aspects of life have presented a new opportunity for cognitive bias: the virtuality bias.

Imagine you post a selfie on social media and receive a great deal of positive feedback-- your outfit, your hair, and other aspects of your appearance are praised. You are most likely to experience this feedback as real and deserved. The fact that it is a picture online and that the people responding barely know you or do not know you at all are not considered. Receiving the same praise in person from others, even strangers, does not feel especially different--their positive feedback is also real and deserved. Now imagine the same situation, but with negative feedback: strangers on the internet disparage your weight, your greying hair, or your facial expression. You are much more likely to write off this feedback, because these are "people on the internet" who do not know you and whose motives are unclear, whereas receiving the same response, even from strangers in public, may cause you to consider a diet and a dye job. Because communications and behaviors in virtual worlds have not fully been accepted into the mainstream as "real" and indicative of your actual nature as a person, you have the choice whether to treat the experience as real or virtual. And you will most likely choose the one that provides the greatest boost to your self-image.

The above example has many alternative explanations. The internet has a reputation for bringing out the worst in people, due to, among other things, deindividuation (e.g., Reicher, Spears, & Postmes, 1995). Trolling, or intentionally provoking a negative reaction online, has become commonplace (Buckels, Trapnell, & Paulhus, 2014). However, there should be just as much reason to doubt the positive reactions of your internet followers as their negative reactions—on social media, it is much easier and more normative to provide spontaneous praise

(i.e., by simply pressing "like") than in person, and the ease of content consumption means that they likely only gave your picture a cursory glance. And yet, as the previous chapters suggest, positive online feedback is taken seriously enough to be used for purposes of narcissistic supply.

This bias isn't limited to feedback. One's own actions and even aspects of the self seem to be declared real or virtual based on desirability. A recent study into racial bias asked participants to engage in violent or nonviolent actions in a video game, giving half of each group a black avatar and half a white avatar. Individuals with the black avatar displayed more negative bias toward black people, but only when they engaged in violent behavior. One explanation for this may be that they attributed more of that behavior to the avatar than to themselves, using a convenient stereotype to relegate their undesirable actions to a virtual character rather than own the actions themselves (Yang, Gibson, Lueke, Huesmann, & Bushman, 2014). In another recent study, the well-known Proteus effect (Yee, Bailenson, & Duchenneaut, 2009) was tested to see if it extended to personality. The Proteus effect describes the tendency of individuals to take on behaviors and characteristics of their avatars in virtual worlds; for example, individuals given a taller avatar were more assertive in a negotiation, whereas individuals given a more attractive avatar were more friendly in a social interaction, than those given inferior avatars. However, the Proteus effect has not been extensively tested with undesirable traits. McCain, Ahn, & Campbell (in review) tested whether women would take on the narcissistic traits and luxury shopping behaviors of Kim Kardashian when assigned an avatar of her in a VR shopping simulation. Contrary to past research, participants using the Kim avatar showed significantly lower narcissism scores than participants using a generic avatar and showed no difference in virtual

shopping behavior. Rather than take on the publicly disliked trait of narcissism, participants appeared to distance themselves from her character, again relegating undesired traits to their virtual self rather than their "real" self.

Do Those High in Narcissism Perceive Virtual Worlds as More Real?

If a self-serving virtuality bias were to exist, one might predict that individuals high in narcissism would rate virtual worlds as more real (less virtual) than individuals low in narcissism. Although this hypothesis has not been tested, Snell (2017) found extraversion and agreeableness (two traits that are major components of narcissism; Glover, Miller, Lynam, Crego, & Widiger, 2012) to be unrelated to ratings of reality for virtual worlds such as social media, online dating, and video games. In his study, people on average rated these worlds at 2.69 on a scale from 1 (*virtual*) to 5 (*real*); if individuals high in narcissism regularly depend on virtual worlds for narcissistic supply, we may predict that narcissism scores would be significantly correlated with higher ratings of reality.

However, it is more probable that, like a self-serving attributional bias, virtuality bias can fluctuate widely based on the situation. An ideal test of such a bias would be to use experimental designs to manipulate perceptions of virtuality in real time. Do individuals high in narcissism have a higher tendency to discount negative feedback when it is from a virtual source than when it is from a physical source? Do ego threats induced in virtual environments prompt the same behaviors as in-person threats? When given the choice to do unflattering behaviors in either a physical or a virtual setting, will they choose the virtual option? Will they choose the physical option for self-enhancing behaviors, all else being equal?

Understanding the potential for self-serving virtuality bias has potential applications in many areas of our world. As more of our important actions in our work, business, leisure, and social lives get relegated to virtual platforms, the knowledge of whether our friends, partners, customers, employees, and opponents consider our interactions to be real and when can radically alter the way we implement emerging technology.

Conclusion

Mainstream media has for a long time maintained that the use of virtual worlds, particularly social media, has caused an increase in narcissism. Although the research does not support this assertion, virtual worlds can allow for more opportunities to express narcissism, giving the illusion that narcissism has increased. Much more work needs to be done, but the existing evidence suggests that individuals who are sufficiently motivated to self-enhance will, when presented with an environment that allows for that self-enhancement, take advantage of it without hesitation (with perhaps the exception of those high in vulnerable narcissism). To the extent that narcissistic behaviors are a problem, this problem can be addressed at the level of the virtual world or the individual. In the virtual world, features that afford self-enhancement can be changed or counterbalanced with features that encourage more desirable behaviors. However, a more effective strategy may be to address the underlying motivations individuals bring with them to the virtual world. Our current culture places more emphasis on individualism and self-esteem than it did in the past (Twenge, 2007) while a crashed economy and decreasing belongingness (Putnam, 2001) make it harder to live up to these values. By decreasing the pressure to be special, increasing opportunities to do so, or both, societal change can remove the need to use virtual spaces to enhance the real self.

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