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Personality and Internet usage: A large-scale representative study of young adults

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ABSTRACT

Studies that have examined the relationship between personality and Internet use so far were largely conducted on the basis of small, non-representative samples, and have yielded conflicting results. In the current study we estimate the relationship of the Big 5 personality traits and Internet use in a large nationally representative U.S. sample of over 6900 young adults with average age of 26. Our results suggest that global Internet use is positively related to Extraversion, Neuroticism, and Conscientiousness. We also examine the relationship of the Big 5 with online communication, leisure, academic, and economic activities. Extraversion is correlated with the most different Internet activities. Our findings contrast with many of the relationships found in previous research which have used small, homogeneous samples. We discuss these differences in term of the size and type of samples which were used in previous research, in terms of the time periods of Internet development in which the research was conducted, and in terms of the Internet activities which were measured.

1. Introduction

Though in widespread use for still less than twenty years, the Internet has become pervasive, penetrating many aspects of daily life. People use the Internet for seeking information, getting news, purchasing products, gaming, communication, education, citizen journalism, civic and governmental activities, and more. Ever since the Internet began to surge in popularity, it has been a topic of interest to understand what might predict its use.

Personality has been a well-studied factor for predicting Internet use. Personality has drawn interest as a predictor perhaps because it has been shown to predict a number of different types of behavior that relate directly or indirectly to Internet usage. Examples include consumer behavior (Kassarjian, 1971), job performance (Barrick & Mount, 1991), academic achievement (Komarraju, Karau, Schmeck, & Avdic, 2011), team performance (Kichuk & Wiesner, 1997), media preferences (Kraaykampa and van Eijck (2005), Internet banking (Grabner-Kräuter & Faullant, 2008), technology adoption (Vishwanath, 2005), online reviews (Picazo-Velaa, Choua, Melchera, & Pearson, 2010), religiosity (Saroglou, 2002) and unethical Internet behavior (Karim, Hidayah, & Nor, 2009).

Most studies predicting Internet use have used the Big Five dimensions of personality (McCrea & Costa, 1999), as these have been well-validated and shown to be consistent and comprehensive in scope (Digman, 1990). They have been shown to be robust across a range of different frameworks, populations, and cultures (Barrick & Mount, 1991; Conley, 1983). The Big Five characterizes personality using five different traits (McCrea & Costa, 1999). *Extraversion* refers to the tendency to want to be with others, to have strong social skills, and to seek social stimulation. Extraverts generally have many friends. *Conscientiousness* refers to the propensity for planning, and seeking high achievement. Individuals with this trait have a strong sense of purpose. *Openness to Experience* refers to being open to change and variety, and possessing intellect. Such individuals often have many hobbies and diverse interests. *Neuroticism* is the tendency to feel guilty, depressed or anxious. Individuals with this trait tend to be pessimistic. *Agreeableness* refers to cooperative behavior, deferring to others during a conflict. High agreeableness is associated with high quality relationships among team members whereas low agreeableness is associated with a lack of concern for others. The Big 5 traits will be described in more detail in Section 4.

2. Literature review: Internet usage and personality

Numerous studies have examined personality as predictors of what is referred to as global (i.e. general) Internet usage. Landers

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and Lounsbury (2006) studied the relationship of the Big 5 Personality traits with Internet usage with 117 university students. Students filled out the Big 5 personality inventory and then also completed an 8-point item of Internet usage ranging from less than one hour/day to more than 10 h/day. They found that Agreeableness, Conscientiousness, and Extraversion were negatively correlated with Internet usage. Anolli, Villani, and Riva (2005) also found Extraversion to be negatively correlated with Internet usage.

McElroy, Hendrickson, Townsend, and DeMarie (2007) also studied the effect of the Big 5 on global Internet use with 153 university students. In contrast to the findings of Landers and Lounsbury (2006), they found that after controlling for computer anxiety, self-efficacy, and gender, Openness to Experience was positively correlated with Internet use, and Neuroticism showed a trend to predict Internet use. They also examined Internet use and cognitive style using the Myers-Briggs Type Indicator (MBTI), and found no significant relationship. Hills and Argyle (2003 found no relationship of Extraversion or Neuroticism with amount of Internet use. This difference in the two studies could be due to the age of the participants in the Hills and Argyle study: people ranged in age from 19–84, with a mean age of 44 years. In contrast to these studies, Engelberg and Sjoberg (2004) found no relationship with any of the Big 5 traits and frequency of Internet use.

It is worth mentioning that other personality traits than the Big 5 have been examined in conjunction with Internet use. Shyness (related to Intraversion) bore no relationship with amount of Internet use nor did anxiety (a trait related to Neuroticism) (Scealy, Phillips, & Stevenson, 2002). People with lower self-esteem (which is related to Neuroticism) spend more hours on the Internet (Armstrong, Phillips, & Saling, 2000). The narrow personality traits of Optimism and Work Drive were negatively correlated with Internet usage whereas the trait of Tough-Mindedness (related to Conscientiousness) was positively correlated with Internet usage (Landers & Lounsbury, 2006).

The Internet has grown so varied in its offerings that focusing solely on global Internet use might fail to capture important differences in how personality might relate to specific online activity. For example, online communication such as text chat lacks rich social cues and those scoring high in Neuroticism, characterized by anxiety, may be uncomfortable without such cues (cf Amiel & Sargent, 2004). On the other hand, leisure activities such as listening to music or watching movies can be relaxing which could be attractive activities for those high in Neuroticism (Swickert, Hittner, Harris, & Herring, 2002; Wolfradt & Doll, 2001). Thus, to gain a nuanced understanding of personality and online behavior we include a focus on categories of Internet use.

Different Internet activity categorization schemes have been proposed. O'Dell et al. (2000) divided Internet use into nine categories and focused on gender differences with respect to email, school research, sex sites, chat, shopping, general research, news, games and music. Amichai-Hamburger and Ben-Artzi (2000) identified three broad categories of Internet usage based on a principle components analysis: for leisure, information seeking, and social activities. Based on the results of both O'Dell and Hamburger and Ben-Artzi, Landers and Lounsbury (2006) divided Internet usage into categories of leisure (music, role-playing, shopping), communication (email and chat), and academic behavior (research, online course participation). While O'Dell's scheme may be too fine-grained to analyze a relation with personality, we use instead the scheme of Landers and Lounsbury (2006) as it incorporates three popular and well-defined Internet activities that have received much research attention concerning personality traits. In addition, we also include online economic behavior as there is some research addressing how personality relates to e-commerce activity (McElroy et al., 2007; Tuten & Bosnjak, 2001; Wang & Yang, 2008). We next review personality research as related to the categories of online communication, leisure, academic and economic behaviors and discuss how the results are conflicting.

2.1. Communication

Online communication media differ in the amount of social cues offered, ranging from text, to video and audio. Yet compared to face-to-face interaction, such communication lacks richness and can be ambiguous in meaning. People scoring high on different personality traits may exhibit unique preferences for online expression. It has been proposed that those who score high on Introversion and Neuroticism can better express their "true self" through Internet communication while those who score high on Extraversion find an expression of self more in face-to-face interaction (Amichai-Hamburger et al., 2002). Evidence though has not fully supported this: Extraversion was shown to positively correlate with using the Internet to maintain both remote and face-to-face friendships (Tosun & Lajunen, 2010) and was positively related to information exchange, which included email (Swickert et al., 2002). With adolescents, Extraversion was correlated with Internet communication (Wolfradt & Doll, 2001). In contrast, Extroversion was found to be negatively correlated with feeling comfortable communicating online (Amiel & Sargent, 2004) and with using online chat (Anolli et al., 2005), also in contrast to the claim of Amichai-Hamburger et al. (2002).

Neuroticism was shown to be negatively related to the use of text messaging (Amiel & Sargent, 2004) and instant messaging (Swickert et al., 2002). Neuroticism as well as Openness were also negatively related to information exchange (Swickert et al., 2002). In contrast, Tosun and Lajunen (2010) found no correlation with Neuroticism and any variables related to communicating with friends on the Internet. Anxiety (related to Neuroticism) and shyness bore no relationship with Internet communication behaviors (Scealy et al., 2002). Openness was found to be negatively related to information exchange (Swickert et al., 2002) and positively related to blog-writing (Guadagno, Okdie, & Eno, 2008).

Communication through the Internet is being done increasingly more through Facebook. Though our communication measure does not explicitly ask about Facebook use, in 2008 at the time our data was collected, 29% of Internet users were currently using a social network site (Pew, 2008). Ross et al. (2009) found that Extraversion predicted significantly more membership in Facebook groups. High Neuroticism predicted use of the Facebook Wall, whereas low Neuroticism predicted posting of photos. The authors explain this as Neuroticism seeks to have more control over information, and photos are far more expressive than the text used on the Facebook Wall. Ryan and Xenos (2011) found that Facebook users scored high on Extraversion and low on Conscientiousness. Neuroticism was significantly positively correlated with time spent on Facebook while Conscientiousness was significantly negatively correlated with time spent on Facebook. Extraversion and Openness to experience were positively correlated with social network site use and instant messaging (Correa, Hinsley, & Gil de Zúñiga, 2010). Neuroticism was correlated with using Facebook for socializing (Hughes, Rowe, Batey, & Lee, 2012).

2.2. Leisure

Leisure activities have been defined as those offering freedom of choice along with an enjoyable experience (Passmore & French, 2001). Since it became in widespread use in the mid 1990's, the Internet has been used for an array of leisure activities. People scoring high in different personality traits might exhibit different preferences for online activities which offer pleasurable experiences. Extraversion, which involves seeking stimulation, was indeed found to positively correlate with the broad category of

leisure on the Internet, specifically for men (Amichai-Hamburger & Ben-Artzi, 2000) and with sharing music (Amiel & Sargent, 2004). Neuroticism and Conscientiousness were found to be significantly correlated with leisure uses of the Internet (Swickert et al., 2002). Neuroticism was positively correlated with using the Internet for entertainment among adolescents (Wolfradt & Doll, 2001). Conscientiousness (and related Work Drive) however, were negatively correlated with the percent of time using the Internet for leisure activities (Landers & Lounsbury, 2006).

The practice of information-seeking is ambiguous and it is not clear whether it might be done for leisure or serious purposes. Neuroticism was negatively correlated with information-seeking (Amichai-Hamburger and Ben-Artzi (2000). Breaking it down by gender, for men, Extraversion was negatively related to information-seeking (Amichai-Hamburger & Ben-Artzi, 2000). The category of social activity used by Amichai-Hamburger and Ben-Artzi (2000) is also ambiguous with respect to leisure. They found Extraversion to be negatively correlated with social activity while Neuroticism is positively correlated with social activity.

Gaming comprises an important component of leisure activities on the Internet. For example, in 2010, 39% of adults reported that they play, or have played, online games (Pew Internet & American Life Project Poll, 2010). Openness was correlated with using the Internet for entertainment and games (Tuten & Bosnjak, 2001). Extraversion and Agreeableness were found to be negatively correlated with addiction to gaming but they were not found to be related with engagement in gaming (Charlton & Danforth, 2009). In contrast, Teng (2008) found that gamers had significantly higher scores on Openness, Conscientiousness and Extraversion compared to nongamers. Agreeableness was negatively correlated with playing games on mobile phones (Phillips, Butt, & Blaszczynski, 2006).

2.3. Academic behavior

The Internet offers a range of experiences for online learning. Academic sites such as online courses involve a degree of commitment and are generally well-structured (e.g. in terms of material presentation, exams), which could be associated with different personality traits. Extraversion was found to be correlated with using the Internet specifically for research (Amiel & Sargent, 2004) while Conscientiousness was positively correlated with percent of time using the Internet for academic pursuits (Landers & Lounsbury, 2006). Neuroticism was negatively correlated with using the Internet for learning and educational purposes (Tuten & Bosnjak, 2001).

2.4. Economic behavior

Online buying and selling behavior involves critical issues such as trust, security, and privacy. Personality traits may be associated with different reactions to online economic transaction environments where trust, security, and privacy may not be guaranteed. Tuten and Bosnjak (2001) reported that Neuroticism was negatively correlated with using the Internet to find product information, where trust, security and privacy are less crucial considerations. Online purchasing involves more trust and security, and Openness, Agreeableness and Conscientiousness were found to be positively related to buying behavior (McElroy et al., 2007; Wang & Yang, 2008). Neuroticism, on the other hand, was found to be related to online selling behavior (McElroy et al. 2007).

3. Study goal

Table 1 summarizes the conflicting results discussed so far. There could be several reasons for such discrepant results. One reason could be due to the small sample sizes used in the studies of personality traits (e.g. Amiel and Sargent, 2004; Anolli et al., 2005; Engelberg and Sjoberg, 2004; Hills and Argyle, 2003; Landers and Lounsbury, 2006; McElroy et al., 2007; Ross et al., 2009; Swickert et al., 2002). Small effect sizes are important to consider as a result of using small samples in personality research (Butcher, Graham, & Ben-Porath, 1995).

A second reason is that previous studies predicting Internet use have generally not used representative samples of the larger general population. Most studies examining Internet usage have in fact relied on homogeneous samples. This can skew the results and make it difficult to generalize the results to a broader population beyond the nature of the population from which the sample is drawn. With the exception of Correa et al. (2010) who used a U.S. national sample of 959 adults and Hills and Argyle (2003) who used a sample of 220 adults from a local British county, most studies of personality and Internet use have relied on undergraduate university students as research subjects (Amiel and Sargent, 2004; Amichai-Hamburger & Ben-Artzi, 2000; Tuten & Bosnjak, 2001; Mitchell et al., 2011; Swickert et al., 2002; Landers & Lounsbury, 2006; Ross et al., 2009; McElroy et al., 2007). Scealy et al. (2002) used a combination of 177 university students and some adults from the general public. Wolfradt & Doll, 2001 tested high school students. Internet use can change with life experience after university studies (and may be very different if one has not at all attended a university). Therefore Internet prediction with a diverse adult sample can be better generalized to a broader population, particularly to a working population.

Another reason for discrepant results in previous studies may be due to the time period in which the studies were done. While personality traits are invariant, the Internet landscape has changed dramatically over the time range that the studies described here were conducted. To take an example, Landers and Lounsbury's study (first published online in 2004) is most comparable to ours in terms of categories of Internet use. In 2006 there were 817 million global Internet users, which had doubled to 1.6 billion users in 2008, the time of our data measures (Internet World Stats & Population Statistics, 2013). Many new social media applications were launched since 2004 which have affected who uses the Internet. Facebook was launched in 2004, opened in 2006 to the public and in 2008 had over 100 million users (Zuckerberg, 2008). Though blogs have been around since 1998, they gained in popularity beginning around 2004, and in 2008, Technorati (Technorati.com) reported that 184 million people had started a blog and over 350 million people were reading blogs. Twitter was launched in 2006 and by 2008, 11.1% of adult Internet users were using Twitter (Twitter.com). Numerous other popular social media sites such as MySpace, Flickr, Windows Live Spaces, and Orkut (Comscore, 2013) were also highly active in 2008, the time of the measures taken that we are using. Thus, the rapid development of social media sites around 2004 may have also contributed to the conflicting results of studies done prior to, and since this time.

The aim of this study is to reconcile the previous conflicting results by using a large, representative sample. We examine, with a large and broad representative U.S. national sample, how personality traits might predict usage of the Internet and how they might be related to different facets of Internet usage. Our sample is based on a survey of 8,984 participants who were about age 26 when surveyed. Our study differs from previous research in that (1) we rely on a much larger and scientifically selected sample than previous studies have used (many studies have relied on convenience sampling), (2) our sample is of an older population than what is typically studied (university undergraduates), and (3) our sample represents a range of ethnic and socioeconomic groups in the U.S. The data was collected in 2008, a time when social media sites were widely used.

Table 1
Summary of relationships of Big 5 personality traits and Internet activities.[a]

Big 5 factor	Corr	Internet activity				
		Global	Communication	Leisure	Academic	Econ
Extrav.	Pos	McElroy et al.	Correa et al. (social media) Ross et al. (Facebook group membership) Ryan & Xenos (Facebook) Wang, Jackson, Zhang, and Su (2011) (SNS) Wolfradt and Doll	Amiel & Sargent Hamburger & Ben-Artzi (men) Teng (gaming) Swickert et al.	Amiel & Sargent	
	Neg:	Anolli et al. Landers & Lounsbury	Anolli et al. (chat) Amichai-Hamburger et al. (“real me”)	Hamburger & Ben-Artzi (women) Mitchell et al. Wang et al. (2011) (gaming)		
	N.S.	Mitchell et al. (Introversion)	Hills & Argyle Hughes et al. (Twitter; Facebook) Landers & Lounsbury Ross et al. (Facebook features)	Hills & Argyle Landers & Lounsbury	Landers & Lounsbury	
Open	Pos	McElroy et al. Witt et al.	Correa et al. (social media) Guadagno et al. (blogging) Hughes et al. (Twitter) Ross et al. (Facebook user)	Teng (gaming) Kalmus et al. (social media/entertainment) Tuten and Bosnjak Wang et al. (2011) (gaming)		Wang & Yang Tuten and Bosnjak McElroy et al. (buying)
	Neg:					
	N.S.	Landers & Lounsbury	Hughes et al. (Facebook) Landers & Lounsbury	Landers & Lounsbury	Landers & Lounsbury	
Neur.	Pos		Guadagno et al. (women: blogging) Hamburger & Ben-Artzi (women) Hughes et al. (Facebook) Ryan & Xenos (Facebook) Wolfradt and Doll	Wolfradt and Doll		McElroy et al. (selling)
	Neg:		Amiel & Sargent (texting; online discussions) Hamburger & Ben-Artzi (men) Swickert et al. (email)	Swickert et al.	Tuten and Bosnjak	
	N.S.	McElroy et al.	Hills & Argyle Hughes et al. (Twitter) Landers & Lounsbury	Hills & Argyle Teng (gaming)		
Consc.	Pos		Hughes et al. (Twitter)	Swickert et al. Teng (gaming)	Landers & Lounsbury Keller & Karau (online courses)	Wang & Yang
	Neg:	Landers & Lounsbury	Ryan & Xenos (Facebook user; time spent)	Landers & Lounsbury Kalmus et al. (social media/entertainment)		
	N.S.	McElroy et al.	Landers & Lounsbury Ross et al. (Facebook)			
Agree	Pos					Wang & Yang
	Neg:	Landers & Lounsbury				
	N.S.	McElroy et al.	Hughes et al. (Twitter; Facebook) Landers & Lounsbury	Landers & Lounsbury Teng (gaming)	Landers & Lounsbury	

[a] Pos = positive correlation; Neg = negative correlation; N.S. = not significant. All studies listed in reference section.

4. Hypotheses

Based on the above reviewed literature, we have developed the following hypotheses.

H1a. Extroversion should be positively related to general Internet use.

H1b. Extroversion should be positively related to online communication, leisure, academic, and economic Internet activities.

Extraverts gear their attention outward, seeking stimulation from sources other than themselves (McCrea & Costa, 1999). Extraversion is associated with being sociable, assertive, and active (Barrick & Mount, 1991). A characteristic of Extraverts is that they have high social skills and numerous friends, and participate in multiple activities such as clubs and sports teams. As the Internet offers a range of different ways for stimulation we expect that Extraversion is positively related to general Internet use. As Extraverts seek stimulation from other people and are sociable we also expect that Extraversion would be related to online communication. Similarly, because of their drive for stimulation we also expect that Extraverts would engage in online academic activities where they could learn from online courses. We also expect that Extraverts would participate in e-commerce activities where buying and selling could be stimulating.

H2a. Openness should be positively related to general Internet use.

H2b. Openness should be positively related to online communication, leisure, academic, and economic Internet activities.

People who score high on Openness are curious, and exhibit a need for variety, novelty, and change (McCrea & Costa, 1999). They are willing to try new things, engage in new experiences and have a wide range of interests (Barrick & Mount, 1991). We therefore expect that Openness would relate to global Internet use as the Internet affords a range of different types of experiences. Similarly, we expect that Openness would be associated with online communication, where people have the opportunity to meet new people with different interests and of different backgrounds and cultures, especially if they are geographically distributed. Openness has been associated with intellect and intelligence (Digman, 1990) and was found to be positively correlated with engagement in the academic motivation inventory (Komarraju and Karau, 2005). Thus, we would expect Openness to be associated with online academic activities. Openness is also associated with creativity and different hobbies (Wolfradt & Pretz, 2001); we thus expect it to be related to online leisure activities. Openness has also been found to be correlated with risk-taking for gains (Lauriola & Levin, 2001). As purchasing online involves some risk we expect that Openness is associated with online economic activities.

H3a. Neuroticism should be positively related to general Internet usage.

H3b. Neuroticism should be inversely related to online communication and online economic activity.

H3c. Neuroticism should be positively related to academic activities.

Characteristics of Neuroticism involve anxiety, hopelessness, depression, pessimism and feeling vulnerable (McCrea & Costa, 1999). Neurotics tend to be worried and insecure (Barrick & Mount, 1991). Though general Internet usage could expose such individuals to circumstances that could trigger feelings of sadness or pessimism, on the other hand it provides sources of information that could alleviate anxiety. For example, a person worried about illness could check medical symptoms or someone anxious about current events can check news outlets on the Internet. Therefore we expect a positive relation of Neuroticism with general Internet activity. In terms of communication, on the one hand, Amichai-Hamburger, Wainapel, and Fox (2002) propose the notion that Neurotics put the "real me" on the Internet and thus they would engage in more online interaction. Yet, when communicating online, where social cues are minimal and where the ambiguity could be interpreted in a pessimistic way, we expect Neurotics to be less likely to engage in online communication. Because of their pessimistic nature we also expect that Neurotics would be less likely to engage in online economic activity such as purchasing or banking, where online malicious behavior is possible. Neurotics may seek ways to reduce anxiety through online learning; therefore we expect a positive relation with academic activities.

H4a. Conscientiousness should be positively related to general Internet use.

H4b. Conscientiousness should be positively related to Internet academic activities.

H4c. Conscientiousness should be inversely related to leisure activities and economic activities.

People who score high on Conscientiousness are interested in achievement, and are characterized by their striving and planned behavior. They have strong self-discipline and do long-term planning (McCrea and Costa, 1999). Since the Internet offers a range of information sources we expect that seeking and verifying information would be a behavior expected of Conscientious individuals who could use such information for planning purposes. Therefore, we expect a positive correlation with general Internet use. Conscientiousness is associated with educational achievement and volition (Barrick & Mount, 1991) and Keller and Karau (2013) found that Conscientiousness was the most important trait for online course performance. We therefore expect that Conscientiousness would be related to online academic activities. Conscientious people have cautiousness and impulse control (Hogan & Ones, 1997). Because a characteristic of leisure involves free choice (Passmore & French, 2001), we would also expect an inverse relationship with leisure activities. Since Conscientiousness involves planned and structured behavior we expect that those high on this trait would have less interest in pursuing activities such as online game-playing and downloading music, which could be perceived as more spontaneous and a less structured use of time. Due to their impulse control and cautiousness we expect that they would engage less in online economic behavior such as purchasing goods.

H5. Agreeableness should be positively related to online communication and economic activity.

Agreeableness is associated with compliance and deferring to others. It is also associated with a tendency to trust others (Judge & Ilies, 2002) and to be flexible, cooperative, and tolerant (Barrick & Mount, 1991). Agreeableness has not been found to be associated with any work performance measures (Barrick & Mount, 1991); therefore we do not expect that it would relate to global Internet use. Because it is involved with focusing on cooperating and nurturing good relationships with team members, we expect that it is positively related to online communication, which could be used as a medium for facilitating relationships. Because Agreeableness is associated with a disposition to trust, we expect that Agreeableness should be related to online economic activity, which involves a degree of trust in economic transactions.

5. Methods

5.1. Participants

The data were used from an ongoing longitudinal study, the 1997 cohort of the National Longitudinal Survey of Youth (NLSY97). The NLSY97 is a program of the U.S. Bureau of Labor Statistics and collects data on individuals on a wide variety of measures such as employment, education, health, and social well-being (see https://ww.nlsinfo.org/). The NLSY97 has a disproportionate probability sample of 8984 Americans with over sampling of Afro-Americans, Hispanics and economically disadvantaged whites born between 1980 and 1984. However, as the sampling probabilities are known, sampling weights were used to obtain representative statistics. The NLSY97 sampling weights, which are constructed in each survey year, provide an estimate of how many individuals in the United States are represented by each NLSY97 respondent. Individual case weights are assigned to produce group population estimates (see https://www.nlsinfo.org/content/cohorts/nlsy97/using-and-understanding-the-data/sample-weights-design-effects).

The participants were interviewed annually starting in 1997, when they were 15 years old on average with a 13–17 age range. Our analyses draw on the interviews conducted in 2008 (i.e., when participants were 26 years old on average). The surveys sometimes cover different topics and in 2008 the survey addressed topics related to Internet usage. The retention rate in 2008 was 83.7%. Given attrition and missing values, the actual sample size of our study was 6921.

5.2. Variables and measurement

5.2.1. Global Internet use

Internet use was measured as a self-report item on a six point scale with response choices as follow: (1) several times a day, (2) once a day, (3) 3–5 times a week, (4) 1–2 times a week, (5) once every few weeks, (6) less often.

5.2.2. Internet activities

As discussed earlier, we follow the categorization of Landers and Lounsbury (2006) who divided Internet usage into categories of leisure (music, role-playing, shopping), communication (email and chat), and academic behavior (research, online course participation) based on other categorizations (Amichai-Hamburger & Ben-Artzi, 2000; O'Dell et al., 2000). We also include a category addressing economic activity.

Subjects were asked "Have you used the Internet to do any of the following activities?" In addition to this global Internet activity, specific activities were assessed as well. Subjects were given a list of specific activities and were asked to indicate whether they performed (coded as 1) or did not perform (coded as 0) each of the following activities on the Internet. The activities were (1) Send or read email; (2) instant message with friends; (3) download music or video clips; (4) play games; (5) work on research for your school or job; (6) pay bills or bank online; (7) take a class online; (9) buy something. To be consistent with Landers and Lounsbury's (2006)

three types of Internet usage, we created variables that represent each of these three classes. *Using the Internet for communication* was assessed by averaging over the first two items. *Using the Internet for leisure* was assessed by averaging items 3 and 4. *Using the Internet for academic purposes* was assessed by averaging items 5 and 7. *Using the Internet for economic purposes* was assessed by averaging items 6 and 9.

5.2.3. The Big Five personality dimension

Personality was measured using the Gosling, Rentfrow, and Swann (2003) short measure of the big five personality dimensions: Extraversion, Openness to experience, Neuroticism, Conscientiousness, and Agreeableness.

6. Results and discussion

Table 2 presents descriptive statistics of the study variables. Table 3 provides the central results of the study: regression coefficients of the Big 5 personality measures and Internet use, controlled by sex, income, and education. Correlations were weighted by the sample weights to provide an estimate of the relevant U.S. population.

Our results show that Extraversion, Neuroticism and Conscientiousness are positively associated with global Internet use, providing support for Hypotheses 1a, 3a, and 4a. Extraverts, who seek stimulation from sources outside of themselves seem to be attracted to a range of features that the Internet offers. However, our result of Extraversion is in contrast to the negative relationship found by Anolli et al. (2005), and Landers and Lounsbury (2006). The difference could be explained by the smaller number of participants used by these researchers, 158 and 117 respectively. Neurotics, who are prone to anxiety, may use the Internet to relieve anxiety, for example by searching for information to reduce ambiguity. They are also prone to depression and the Internet offers a range of sources for online help. McElroy et al. (2007) found no relation with Neuroticism, which could be due to testing only 153 participants.

Conscientious people, who prefer structure and planning, may use the Internet heavily for information that can be utilized to construct plans. They may also use the Internet for organizing, as they have leadership skills. Our result is in contrast to Landers and Lounsbury (2006) who found a negative relation; again, these researchers used a relatively small sample.

Hypothesis 2a was not supported: Openness showed no relationship with general Internet use, which conflicts with McElroy et al. (2007) and Witt, Massman, and Jackson (2011) who found a positive relation but is consistent with the result of Landers and Lounsbury (2006). We found no relation with Agreeableness and global Internet use as we expected. The characteristics associated with Agreeableness, such as being tolerant and courteous, do not suggest any particular relationship with Internet use. Landers and Lounsbury (2006), however, found a negative relation, which could be attributed to their small and unrepresentative sample.

Table 2
Descriptive statistics of study variables.

Variable	*N*	Mean	STD
Extroversion	7462	4.654	1.363
Openness	7451	5.467	1.106
Neuroticism	7464	3.043	1.340
Conscientiousness	7464	5.688	1.131
Agreeableness	7437	4.981	1.133
Global use	7201	5.648	1.731
Communication	6921	0.722	0.332
Leisure	6921	0.607	0.387
Academics	6921	0.374	0.357
Economic	6921	0.662	0.418

By and large our results indicate that Extroversion and Neuroticism are the strongest predictors of Internet use. We further elaborate next on our findings regarding the use of the Internet for specific activities.

6.1. Communication

Extraversion, Openness, and Neuroticism were positively related to online communication, supporting Hypotheses 1b and 2b, but the result was in the opposite direction we expected for Hypothesis 3b. Past studies have shown very conflicting results with Extraversion and online communication (see Table 1). We find that in contrast to Amichai-Hamburger et al. (2002), who found that Introverts prefer online communication, Extraverts, who seek stimulation from other people, actually prefer online communication. Orchard and Fullwood (2010) propose that Extraverts may use the Internet for increasing their offline social networks whereas Introverts may use the Internet to escape their offline personas. These same researchers propose that both Extraverts and Intraverts may benefit from the social support they receive from the Internet, though in different ways: Extraverts may use the Internet to enhance their already rich offline social networks whereas Intraverts may use the Internet to create social networks. Our results support the former idea: online communication enables Extraverts to experience their social and talkative natures.

What could explain the difference between our results and those of Amichai-Hamburger et al. (2002) is the way the Internet evolved. In 2008, when our survey was done, there were wider choices for communication (especially with the advent of social media sites). It may well depend though on what communication application is being considered. Facebook relies on known people who are members of social networks for interaction as does chat, whereas Internet forums can involve anonymous people in interactions.

Neuroticism was found to be positively related to online communication. There have been widely conflicting reports on the relation of Neuroticism and online communication (Table 1). Our results are consistent with the notion that people who score high in Neuroticism may use the Internet to allay loneliness (Amiel &

Table 3
Standardized regression coefficients of the Big Five dimensions.[a]

	Global use		Communication		Leisure		Academic		Economic	
	β	SE	*β*	SE	*β*	SE	*β*	SE	*β*	SE
Extroversion	0.062**	0.012	0.060**	0.013	0.049**	0.014	0.049**	0.013	0.069**	0.013
Openness	0.020	0.013	0.036*	0.014	0.037*	0.014	0.046*	0.014	0.016	0.013
Neuroticism	0.083**	0.013	0.037*	0.014	0.005	0.015	0.058**	0.014	0.105**	0.014
Conscientiousness	0.036*	0.013	0.025	0.014	0.071**	0.014	0.004	0.014	0.034*	0.013
Agreeableness	0.012	0.013	−0.008	0.014	−0.024	0.014	0.017	0.014	−0.002	0.013

[a] Regression controlled for sex, income, and education: *$p < .01$, **$p < .001$.

Sargent, 2004; Correa et al., 2010; Orchard & Fullwood, 2010). Others found this relation to hold with specific groups: females (Guadagno et al., 2008, and Amichai-Hamburger & Ben-Artzi, 2000) and applications such as Facebook (Hughes et al., 2012; Ryan & Xenos, 2011).

Openness showed a positive relation with online communication. People who score high on Openness prefer online communication perhaps due to the Internet affordance of meeting new people who are geographically disperse with different interests. Our finding is consistent with results relating Openness to a range of social media communications: Correa et al., 2010, with general social media; Guadagno et al., 2008, with blogging; Hughes et al., 2012, who examined Twitter, and Ross et al., 2009, who studied Facebook. Social media interactions enable people high in Openness to express their broad-minded and curious natures through exposure to diverse people.

We found no support for Hypothesis 5: there was no relation of Agreeableness with online communication. This was surprising as we would have expected that people who value others would prefer to communicate through the Internet. Perhaps people who score high in Agreeableness prefer to interact with others face-to-face.

6.2. Leisure activities

Extraversion, Openness, and Conscientiousness were related to leisure activities. Extroverts, who seek stimulation, also seem to prefer listening to music, video, or games online, supporting Hypothesis 1b. Our result of Extroversion confirms the results of others who looked at broad leisure behavior (Amichai-Hamburger & Ben-Artzi, 2000; Swickert et al., 2002) but also more specific uses of music sharing (Amiel & Sargent, 2004). Openness, which involves embracing new experiences, has generally shown a positive relation with leisure, supporting Hypothesis 2b. The exception is the study of Landers and Lounsbury (2006), who again, used a small sample.

We found the opposite direction than we asserted for Hypothesis 4c: Conscientiousness, associated with planned behavior and impulse control, was positively correlated with leisure activities of downloading music and gaming on the Internet. Perhaps Conscientious people engage in leisure in a more structured manner than others. Rettberg (2008) suggests that gaming can provide an environment where people can practice the same kinds of behaviors as they do when striving to achieve in the "real world". This is consistent with the achievement orientation of Conscientious people. Conscientiousness has had conflicting prior results (see Table 1) which could be due to differences in definitions of leisure activity. Swickert et al., 2002, who found a positive relation, defined leisure in terms of instant messaging and gaming whereas Landers and Lounsbury (2006), who found a negative relation, defined it in terms of music listening, role-playing, and purchasing.

6.3. Academic activities

Extraversion, Openness, and Neuroticism were positively related to online academic activities. Our results supported Hypothesis 1b, suggesting that Extraverts seek stimulation though online learning, consistent with the results of Amiel and Sargent (2004), who found Extraversion related to using the Internet for research. We found support for Hypothesis 2b: Openness may relate to academic activities as people with this trait may seek to expand their interests through courses. Our result of Openness is contrary to Landers and Lounsbury (2006), who again, used a small sample. We found that Neurotics seem to prefer visiting online courses and engaging in academic activities. Because of their tendency to feel anxious perhaps Neurotics feel that online learning environments would not be stressful as it enables learning in a private environment (often) at one's own pace. Our results contradict those of Tuten and Bosnjak (2001). One explanation for the difference in results could be due to the development of online course environments since the Tuten and Bosnjak study (e.g. Coursenotes.com, Campus source initiative, and ePath Learning) and new applications that support research, such as Google scholar, which launched in 2004.

6.4. Economic behavior

Extraversion, Neuroticism, and Conscientiousness are positively related to economic behavior. Extraverts prefer online economic behavior, supporting Hypotheses 1b, perhaps because it is stimulating to buy goods online. Our result with Neuroticism did not support Hypotheses 3b; perhaps Neurotics receive gratification from online economic transactions such as buying goods. McElroy et al. (2007) found that Neuroticism is associated with selling products. We found the opposite direction than we expected for Hypothesis 4c: Conscientiousness was actually positively related to economic activities. Perhaps planned and structured behavior is consistent with the idea of conducting online banking and purchasing goods online, which is time-efficient. Our Conscientiousness result is consistent with that found by Wang and Yang (2008). We found no support for Hypothesis 5: there was no relation of Agreeableness with economic activity. Perhaps the trust that is associated with the Agreeableness trait holds more for people and not for e-commerce activities.

6.5. Limitations

Our sample over represents U.S. minorities and economically disadvantaged whites. However, this is a more heterogeneous sample than most studies analyzing Internet use and personality. We were limited in our categorization of Internet usage by the questions used in the NLSY97 survey. Also, the data was collected in 2008 which was the only year that detailed information on Internet use was surveyed. Though the social media "revolution" was already well underway by 2008, ideally further research would be needed to verify and clarify the results.

We should also note that the sizes of the correlations are not large. The sizes of these correlations are, however, comparable with the sizes that were found in previous research (see, for example, Correa et al. (2010), Table 1, p. 5; Landers and Lounsbury (2006), Table 3, p. 288; Hills and Argyle (2003), Table 3, p. 67). It is perhaps the case that global measures of personality have only a limited predictive power of Internet use.

7. Conclusion

With less than a twenty-year history of widespread use, the Internet has been changing rapidly. As new applications develop, it becomes harder to define categories of usage, such as communication or leisure activities. This is important as it affects comparisons of studies over time. We have analyzed a large-scale dataset of survey responses to try to resolve the discrepancies that have existed in the literature since the Internet became popular in the general public. Indeed, the current study is the first examination of the relationship between personality and Internet use which is based on a representative large-scale sample. (Correa et al. (2010) also relied on a representative sample, but centered only on the relationship between personality and usage of social networking sites and instant messaging). Using a sample larger than any previous study of Internet use and personality (the size of Correa et al. study, which is the largest study so far, was about a

seventh of the current study), our results show that Extraversion, Neuroticism, and Conscientiousness are significantly correlated with global usage. We hope that this study can spark research into more large-scale Internet usage studies, especially with a lens on new and emerging Internet behaviors as the Internet evolves.

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