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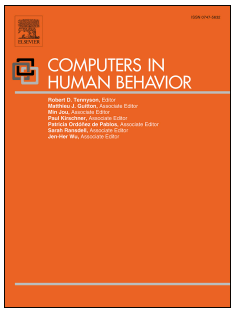

Personality disclosure on social network sites: An empirical examination of differences in Facebook usage behavior, profile contents and privacy settings

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Personality Disclosure on Social Network Sites: An Empirical Examination of Differences in Facebook Usage Behavior, Profile Contents and Privacy Settings

Abstract

The purpose of this study was to objectively investigate the usage patterns of Facebook users with different personalities based on the Big Five model of personality traits and to observe whether their social behaviors on Facebook reflect their offline personalities. In addition, subjects with high and low degrees of each personality trait were investigated to see whether they had different Facebook usage patterns. A total of 111 university students participated in the study. The experiment was divided into two phases: Phase I included a personality test based on the Big Five Inventory, and Phase II consisted of two months of data collection. The results showed that those with high agreeableness were well-socialized on Facebook and that those with high conscientiousness managed a higher number of groups. The users with high openness to experience had more friends and photos on Facebook and were more inclined to post text and make comments. These findings confirmed those of previous studies, showing that extraverts had more friends on Facebook and were more likely to use functions such as messages and wall posting. In contrast to previous studies, the results found that users with low emotional stability were associated with higher levels of event participation, family and relative edits and blocked apps than those with high emotional stability. Regarding privacy, Facebook was used as a platform though which extroversive people could interact with their real-life friends, and they were less interested in using Facebook to interact with strangers on the Internet.

Keywords: Social media, Big Five personality, Facebook usage behavior, profile, privacy.

1. Introduction

Social networking sites have continued to flourish in recent years. According to Statista (2015), in March 2015, Facebook was the first such site to reach 1 billion views, and according to Facebook's official statistics (2015), its average number of daily active users reached 968 million in June 2015. These statistics represent Facebook's powerful influence and massive share of the social media market. Ellison (2007) defined a social networking site as a web-based service that allows users to (1) establish public or semi-public profiles in a connected system, (2) establish connections between a series of entities, each of which has its own system and (3) visualize these connections. Kietzmann, Hermkens, McCarthy, and Silvestre (2011) listed seven features of social media websites: identity (profiles), conversations (online communication), sharing (e.g., Groupons, texts, videos, pictures, sounds, links and locations), presence (online/hidden, check-ins), relationships (specifying connections), reputation (people and content) and groups (clubs, fans). These features allow users to mutually form interactive social networks using the social tools provided by a website. Studies have shown that users' chief motivation for engaging with social media websites is social interaction. For example, Bumgarner (2007) conducted an online questionnaire to understand why people use Facebook and how Facebook meets their users' needs, and the data revealed that people generally used Facebook for social activities, such as interacting with friends, discussing the personal profiles of other users, and so on. Smock, Ellison, Lampe, and Wohn (2011) investigated the usage frequencies of Facebook

features such as status updates, comments, walls, messages, chat, groups and apps, and they identified comments, walls and private messages as the most commonly used features. Ryan and Xenos (2011) also found that walls and messages were the most popular of Facebook's social features. Social media websites incorporate many social tools to let their users interact. On large social networking sites, users tend to interact with those with whom they are already acquainted, indicating that social networking sites allows users to maintain or develop previously established social relationships. In light of these findings, the following question arises: when current social media websites allow users to maintain real-life social relationships patterned after their initial, real-life social behavior, will people who use social media websites for social interaction exhibit similar behavior in real life?

Influence of personality on online and offline social behavior

Previous studies have proposed two hypotheses on online and offline behavior. The rich-get-richer hypothesis postulates that people with existing social structures and social personalities can gain greater benefits through networks and social communication features on the web than can those without (Valkenburg & Peter, 2007). The social compensation hypothesis posits that people who struggle with face-to-face personal interaction view the web as a place to strengthen interpersonal connections by establishing online social relationships (Schouten, Valkenburg, & Peter, 2007). Regarding the two hypotheses, Amichai-Hamburger, Kaplan, and Dorpatcheon (2008) found that among social media website users, extraverts used a greater number of social services than introverts. That is, extraverts transferred their existing social lives to online networks, thereby supporting the rich-get-richer hypothesis. However, among non-social media website users, introverts were heavier users of social network services. This finding verified that introverts might use the web as a tool of social compensation. Early studies on whether social networking sites can reflect the offline personalities of their users occurred in relatively anonymous online environments (e.g., chat rooms and gaming websites). As a result, they generally found that users tend to construct idealized versions of themselves compared to their offline social circles. However, the prominence of social networking sites such as Facebook, MySpace and Twitter has generated renewed interest in how people represent themselves online (Hollenbeck & Kaikati, 2012). A study by Manago, Graham, Greenfield, and Salimkhan (2008) identified MySpace as a site that college students used to create idealized self-images. However, Back et al. (2010) found that user profiles can reflect users' offline personality traits because social media websites combine personal information related to personality, social behavior, thoughts, appearance and a variety of other factors that reflect the surrounding environment. Previous studies have shown that personal profiles indeed reflect users' offline personalities; for example, Gosling, Augustine, Vazire, Holtzman, and Gaddis (2011) found that a user's Facebook profile page can reflect his/her offline personality (with "Facebook profile" referring to a Facebook page with the user's profile photo, "About me" section, wall, photos, friends, etc.). Therefore, Facebook is a potential medium to convey a user's offline personality.

Personality and Facebook

Several studies have investigated user behavior on social media sites. In recent years, in addition to focusing on users' motivations and preferences for social media site features, many researchers have begun to focus on identifying user types on social media sites. For example, the relationship between multi-faceted personality and Facebook usage behavior has been studied (Gosling et al., 2011; Ross et al., 2009; Ryan & Xenos, 2011). Five personality traits—

neuroticism, extraversion, openness to experience, agreeableness and conscientiousness—are often used to distinguish these user types. Neuroticism refers to an inclination to perceive psychological pain and be highly sensitive to peril; extraversion refers to sociability and positivity; openness to experience refers to a readiness to consider options or alternative solutions with curiosity in artistic pursuits; agreeableness refers to trustworthiness, empathy and the enjoyment of cooperation; and conscientiousness refers to well-organized, diligent and cautious behavior.

Ross et al. (2009) investigated the correlations between five personality traits and Facebook use and found that certain personality traits were correlated with usage behavior. For example, most extraverts used Facebook. However, in terms of their numbers of friends and use of the site's communication features, extraverts were likely to view Facebook as a tool for maintaining real-world social relationships rather than as a replacement for real-life socialization. In addition, users with the neuroticism trait preferred "the wall" feature of Facebook, while those with the openness to experience trait tended to be more sociable on Facebook but had less knowledge of computer-mediated communication. In their study of the relationship between Facebook usage behavior and personality, Ryan and Xenos (2011) added the Narcissistic Personality Inventory and the Revised Cheek and Buss Shyness Scale on top of the five personality traits to make the personality types more subtle and comprehensive. After conducting a factor analysis, they classified relevant Facebook behavior into active social contributions, passive engagements, news and information disclosure and real-time social interaction. The features related to active social contributions were status updates, walls (timelines), messages (comments), notes, likes, events and photos. The personality traits that were positively correlated with those features included extraversion and agreeableness, and the trait that was negatively correlated with these features was emotional stability. The features related to passive engagement were groups, games and fan pages; they were also negatively correlated with extraversion and emotional stability. The features related to disclosing news and information were events and notes, which were positively correlated with agreeableness and openness to experience and negatively correlated with conscientiousness. The feature related to real-time social interaction was chat, and the personality traits that were positively correlated with this feature included extraversion. Furthermore, Wang and Stefanone (2013) studied the association of Facebook social behavior and personality traits for the following Facebook activities: posting, uploading photos (tagging oneself or one's friends), check-ins, status updates and personal profile edits (self-disclosure or self-expression). The personality traits that were positively correlated with self-disclosure or self-expression behaviors included extraversion (Wang & Stefanone, 2013), agreeableness (Ryan & Xenos, 2011) and openness to experience (Amichai-Hamburger & Vinitzky, 2010). The personality traits that were negatively correlated with self-disclosure or self-expression behaviors included conscientiousness (Ryan & Xenos, 2011) and emotional stability (Amichai-Hamburger & Vinitzky, 2010; Seidman, 2013). In terms of the correlation between personality traits and general Facebook usage, researchers have primarily focused on different personality traits and information privacy concerns on Facebook (Osatuyi, 2015; Quercia et al., 2012; Stieger, Burger, Bohn, & Voracek, 2013; Sumner, Byers, & Shearing, 2011). For example, Sumner et al.(2011) collected users' basic profile information, language used in photo descriptions and wall posts, and self-reported concerns about online privacy issues. Their results show a relationship between Facebook activity and personality traits: extraverts and people with high agreeableness have fewer concerns about online privacy.

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1.1 Personality traits and hypotheses

Based on previous studies, we define the present study's hypotheses for each of the characteristics associated with the so-called "Big Five" personality traits and Facebook tool usage behaviors below.

(1) Extraversion

Extraverts have outgoing, gregarious and enthusiastic personalities. Previous studies have found that extraverts are more likely than introverts to be Facebook users and that, consistent with their personality traits, they have an extraordinarily large number of Facebook friends (Amichai-Hamburger & Vinitzky, 2010; Ross et al., 2009). Extraverts are also more likely than introverts to use the active social features of Facebook such as status updates, messages, likes, and others (Ryan & Xenos, 2011). In addition, related studies have proposed the concept of self-disclosure to describe behavior that advances the interpersonal goals of different personality types, such as presenting a positive and likable image to others (Seidman, 2013). Previous studies have found that different personalities exhibit specific types of self-disclosure behavior on Facebook (Gosling et al., 2011) and that highly extraverted people are associated with high levels of information disclosure. That is, they are willing to share their feelings, thoughts, personal photos and relationships on Facebook. Thus, our extraversion hypotheses are as follows:

Hypothesis 1-1: Because extraverts have outgoing, gregarious and enthusiastic personalities, their Facebook usage behaviors tend to reflect the use of active social features such as messages, likes, photos, etc.

Hypothesis 1-2: Because extraverts have outgoing, gregarious and enthusiastic personalities, they tend to have a relatively large number of Facebook friends and tagged photos and movies on their Facebook profiles.

Hypothesis 1-3: Because extraverts have outgoing, gregarious and enthusiastic personalities, they tend to set their Facebook privacy settings to "public" and are willing to use less restrictive features to allow people to search for them.

(2) Agreeableness

People with high agreeableness are pleasant, kind, helpful, cooperative and optimistic toward, and trusting of, humanity. They have been associated with a high level of information disclosure (Acar, 2008; Amichai-Hamburger & Vinitzky, 2010; Cervone & Pervin, 2013), such as posting photos or disclosing their locations with the Facebook check-in feature (Bachrach, Kosinski, Graepel, Kohli, & Stillwell, 2012). Moreover, they are willing to use Facebook's active social features and participate in news and information activities and notes (Ryan & Xenos, 2011). Therefore, our agreeableness hypotheses are as follows:

Hypothesis 2-1: Because people with high agreeableness are pleasant, kind, cooperative and willing to use the active social features of Facebook, they tend to participate in Facebook events and notes.

Hypothesis 2-2: Because people with high agreeableness are pleasant, kind, cooperative and willing to use the active social features of Facebook, they tend to have relatively large numbers of friends, tagged photos and movies on their Facebook profiles.

Hypothesis 2-3: Because people with high agreeableness are pleasant, kind, cooperative and willing to use the active social features of Facebook, they tend to set their Facebook privacy settings to "public" and are willing to use less restrictive features to allow people to search for them.

(3) Conscientiousness

People with high conscientiousness are task-oriented, organized, self-disciplined, responsible and ambitious and give the impression that they are trustworthy and responsible. Studies have found that Facebook users have lower conscientiousness scores than those of non-Facebook users, presumably because less conscientious people view Facebook as a place to escape from work (Ryan & Xenos, 2011). If a highly conscientious person believes Facebook will not increase his/her efficiency or productivity levels, he/she will be less inclined to use Facebook, post photos and post on walls (Devaraj, Easley, & Crant, 2008; Moore & McElroy, 2012). Because conscientiousness involves high-target orientation, people with this trait are more likely to strive for a larger number of friends (Amichai-Hamburger & Vinitzky, 2010). In addition, people with the conscientiousness personality trait are wary of self-expression on Facebook (Seidman, 2013). Therefore, our conscientiousness hypotheses are as follows:

Hypothesis 3-1: Because people with high conscientiousness are organized and responsible, they tend to be involved with relatively large numbers of Facebook groups and events.

Hypothesis 3-2: Because people with high conscientiousness are task-oriented and ambitious, if their Facebook usage does not increase their efficiency or production levels, they tend to decrease that usage and rarely update their Facebook profiles. However, they tend to have more Facebook friends because of their high-target orientation.

Hypothesis 3-3: Because people with high conscientiousness are more cautious with self-expression, they tend to use Facebook privacy settings that restrict others' ability to search for and access their personal information, posts and tagged posts.

(4) Emotional stability

Emotional stability is the opposite of neuroticism. People with high neuroticism are prone to psychological depression, unrealistic ideas and excessive cravings; they also tend to act impulsively and respond inappropriately in certain situations. Research has shown that neuroticism is negatively associated with social relationships (Wehrli, 2008) and positively related to the amount of time one spends online (McElroy, Hendrickson, Townsend, & DeMarie, 2007). High neuroticism is also associated with disclosures of greater amounts of personal information, feelings and thoughts on Facebook than those by people with moderate level of neuroticism (Amichai-Hamburger & Vinitzky, 2010; Seidman, 2013). This tendency may be due to efforts to look as attractive as possible online and the need for self-assurance. Research has also shown that self-reported privacy concerns were significantly positively correlated with neuroticism, indicating that a neurotic person is more likely to be concerned about online privacy (Sumner et al., 2011). Therefore, our emotional stability hypotheses are as follows:

Hypothesis 4-1: Because people with low emotional stability (i.e., neuroticism) are prone to experience psychological depression, have excessive cravings or impulses, spend prolonged periods of time online and to disclose their personal feelings and thoughts, they are more likely to use Facebook posts, comments and likes.

Hypothesis 4-2: Because people with low emotional stability (i.e., neuroticism) are prone to psychological depression and to be nervous, restless, emotional and melancholy, they tend to have relatively few Facebook friends.

Hypothesis 4-3: Because people with low emotional stability (i.e., neuroticism) are more likely to have concerns about privacy issues, they tend to use restrictive Facebook privacy settings.

(5) Openness to experience

Openness to experience measures one's willingness to seek new experiences and to tolerate and explore the unknown. Highly open people are curious, possess imagination and creativity and are unchained by tradition, whereas those who have a low degree of openness are more inclined to follow tradition, have narrower interests and exhibit less interest in art than highly open people. Amichai-Hamburger and Vinitzky (2010) indicated that highly open people were inclined to use several Facebook features, likely due to their curiosity and willingness to seek out new experiences. Moreover, the fact that they frequently enjoy using social networking sites, combined with their openness to new experiences, indicates that they are likely to share their novel experiences on Facebook. Thus, those who exhibit high openness to experience are more likely to use the self-disclosure features of Facebook. Therefore, our openness to experience hypotheses are as follows:

Hypothesis 5-1: Because people with the openness to experience trait are curious and willing to seek out new experiences and frequently enjoy using social networking sites, they are inclined to make Facebook posts and comments.

Hypothesis 5-2: Because people with the openness to experience trait are curious and willing to seek out new experiences and frequently enjoy using social networking sites, they tend to have a high number of Facebook friends, uploaded photos, check-ins and checked-ins.

Hypothesis 5-3: Because people with the openness to experience trait are curious and willing to seek out new experiences and frequently enjoy using social networking sites, they are inclined to allow others access to their personal information, posts and tagged posts.

1.2 Objective data collection

Although Ross et al. (2009) and Ryan and Xenos (2011) provided a foundation to investigate the relationship between Facebook usage behavior and personality, both studies used subjective questionnaires to measure Facebook usage behavior. Amichai-Hamburger and Vinitzky (2010) maintained that acquiring user behavior objectively is more effective than using a subjective questionnaire method because the latter might cause bias, resulting from the respondents' subjective beliefs. In addition, Moore and McElroy (2012) extended Amichai-Hamburger and Vinitzky's (2010) objective investigation by obtaining information through subjective questionnaires that measured the amount of time users spent on Facebook, their usage frequency and the frequency of regrettable postings. They objectively analyzed the respondents' Facebook profile pages with respect to their numbers of friends, photos and timeline posts. The results showed that personality explains a significant quantity of user variance, greater than that explained by gender and Facebook experience, in terms of users' number of Facebook friends, the nature of their timeline postings and their level of regret after posting inappropriate Facebook content.

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Current investigators have proposed using a collection of objective data to study the correlation between personality and Facebook usage behavior; nevertheless, to date, no single study has collected thorough, objective data on Facebook features. The data collected in Amichai-Hamburger et al. (2008) merely consisted of Facebook profile information, whereas Moore and McElroy (2012) only focused on what users do and put on Facebook (e.g., the user's number of friends, photos and timeline posts). Furthermore, some studies have investigated the correlation between personality, privacy concerns, and information disclosure on Facebook (Quercia et al., 2012; Stieger et al., 2013; Sumner et al., 2011). Therefore, in this study, we sought to collect objective data on Facebook, including user profile pages, usage behavior, and privacy settings, to investigate the social behavior of Facebook users with different personalities. Overall, the purpose of this study was to objectively investigate the usage patterns of Facebook users with different personalities and to observe whether their social behaviors on Facebook reflect their offline personalities. Moreover, we were interested in whether there are significant differences in Facebook usage patterns among people with high and low degrees of each personality trait.

2. Method

2.1. Participants

A total of 111 university students participated in the study. Because personality can change with age (Rantanen, Metsäpelto, Feldt, Pulkkinen, & Kokko, 2007), we focused only on participants aged between 18 and 25 years and included undergraduate and postgraduate students as this study's subjects. We did so to obtain a representative sample with stability and variety in personality dimensions.

Sample size distinguishes the present research from previous studies, which were mainly carried out through online surveys or through Facebook information updated only once during the study period. For example, 97 university students with an average age of 21.69 years participated in Ross et al.'s study (2009); 219 undergraduate students participated in Moore and McElory's study (2012); and 1324 self-selected Internet users aged between 25 and 34 years were required to complete the online questionnaire to participate in Ryan and Xenos's study (2011). This study observed the usage patterns of Facebook users and their offline personality traits to determine if the latter were reflected online. It was necessary to set an appropriate period of time to collect data on the participants' Facebook usage behavior. All of the 111 participants, consisting of 61 males and 50 females, were Facebook users, and their usage behaviors were examined for the two-month experimental implementation phase. In reference to the study by Ross et al. (2009), it is noted that a smaller sample size (e.g., 97 subjects) allows for greater statistical sensitivity in searching for group differences.

2.2 Materials

Big Five Inventory (BFI)

The study consisted of two parts. The first entailed an electronic Big Five Inventory survey that was administered in a campus lab. The Big Five Inventory (BFI) (Benet-Martínez & John, 1998; John, Naumann, & Soto, 2008; John & Srivastava, 1999) is a personality scale containing

44 questions that measure five personality traits: extraversion (8 questions), agreeableness (9 questions), conscientiousness (9 questions), emotional stability (8 questions) and openness to experience (10 questions). For each question, the respondent is asked to mark the degree to which he/she agrees with a brief statement using a 5-point Likert scale (ranging from 1 = "strongly disagree" to 5 = "strongly agree"). The BFI has been shown to have good reliability and validity and is often used in studies correlating personality with social media website data (Carpenter, Green, & LaFlam, 2011; Golbeck, Robles, & Turner, 2011; Ryan & Xenos, 2011).

Before administering the Big Five personality test commenced, we established a percentile database as the basis on which to provide which personality feedback to the respondents. We first distributed an online BFI survey extracted from the lab across the campus, which was completed by 100 anonymous students aged between 18 and 25 years. Each subscale was scored and converted into a percentile rank based on the scoring instructions in the BFI test manual (McConochie, 2007). Using the BFI scale scores, we then calculated Z-scores by dividing the raw scores by the number of questions (8 on extraversion, 9 on agreeableness, 9 on conscientiousness, 8 on emotional stability and 10 on openness to experience), subtracting the average and again dividing by the standard deviation. Following the ranking method defined in Ryan and Xenos (2011), the calculated Z-scores were then used to establish the percentile data from all respondents, and the data to calculate each subject's percentiles were collected. The purpose of having percentile rankings for different levels of personality traits was to investigate the different impacts of high and low personality traits on Facebook usage (Amichai-Hamburger & Vinitzky, 2010; Ross et al., 2009). Each personality test result was assigned one of five different percentile rankings: low scoring (≤ 19th percentile), moderately low scoring (20-39th percentile), average scoring (40-59th percentile), moderately high scoring (60-79th percentile), and high scoring (> 80th percentile). That is, upon completion of the BFI survey, the personality of each subject was classified based on his or her percentiles on the Big Five personality traits. Those who scored below the 19th percentile were classified as having a low degree of the personality trait, and those who scored above the 80th percentile were classified as having a high degree of the personality trait. Therefore, the same subject might be classified as high in extraversion but low in openness to experience. An analysis of the personalities of the 111 subjects is shown in Table **1**.

Table 1 Distribution of the number of subjects across the five personalities based on low and high degrees of trait endorsement.

		Extraversion	Agreeableness	Conscientiousness	Emotional Stability	Openness to Experience
Low	Male	27	20	24	28	32
	Female	22	23	22	15	15
	Total	49	43	46	43	47
High	Male	22	30	24	18	21
	Female	18	15	20	23	21
	Total	40	45	44	41	42

Facebook data collection

The second part of the study entailed a Facebook usage behavior survey. Previous studies on personality and Facebook usage behavior have described current Facebook features and website representations (Amichai-Hamburger & Vinitzky, 2010; Gosling et al., 2011; Ross et al., 2009; Ryan & Xenos, 2011). A number of these investigators did not classify Facebook data, and others categorized Facebook profiles according to content and other features. In this study, a Facebook app - the graph application programming interface (API) - was used to acquire the subjects' usage behavior data. The collected Facebook profiles were categorized based on content and other features, and the collected data consisted of profile content, usage behavior and privacy settings. Because of the app's limitations, privacy settings could not be acquired automatically. Consequently, privacy settings data were obtained via a questionnaire that asked the respondents about their Facebook privacy settings. The items on each respondent's Facebook profile webpage (timeline) were collected as profile content data, including edited elements in the "About me" section (profile), the number of uploaded or tagged photos/videos, number of photo albums, number of tags and checked-ins, content (photos, videos, movies, TV, books and other fan pages) that the respondent liked and the number of notes.

For the collection of usage behavior data, the Facebook questionnaire by Ross et al. (2009) was supplemented with recently added Facebook features, including the respondent's weekly time on Facebook, the usage frequency of each feature and the user's participation in groups and events. The respondent's weekly time spent on Facebook was measured in hours, and other usage behaviors were measured in terms of the number of profile photo/cover photo changes, published photos, comments on photos, posted texts, comments (replies), private messages and likes. Each user's participation in groups and events was measured by his/her number of group memberships, groups created, events attended and events held.

For the collection of privacy setting data, the study recorded each user's current Facebook privacy settings content. The included features were the number of viewers who had access to the user's profile, settings for adding or checking the user's posting audience, settings to permit searches on the user's profile and other webpages and settings for blocking other users or apps. The encoding for these features was based on Facebook's privacy setting criteria: "Who can see your profile?"; "Who can add things to my timeline?"; "Who can see my stuff?"; "Who can see posts you have been tagged in on your timeline?"; "Who can see what others post on your timeline?"; "Who can look you up using your e-mail address or the phone number you provided?"; and "Do you want other search engines to link to your timeline?" To code the privacy settings, we ranked subjects with stricter settings (i.e., "only I can see my profile") higher on the scale (Table 2). Subjects with a higher number of blocks on users/apps/events were also interpreted as having stricter privacy settings.

It is noted that during the survey period, "Posting text", "Comments", "Likes", "Number of messages", "Profile photos", "Cover photos", "Groups", "Events" and "Notes" collected a total of 5,922, 19,021, 21,221, 117,049, 1,445, 365, 2,354, 3,606 and 121 items of data, respectively.

Table 2 Coding of privacy based on Facebook settings.

Privacy Setting	Code
Only Me	5

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Custom	4
Friends	3
Friends of Friends	2
Everyone	1

2.3 Procedure

Ethical approval for our study was obtained from the Institutional Review Board (IRB), Chang Gung Hospital, Taoyuan, Taiwan. All of the relevant safeguards for ethical consideration and subject protection were met. A total of 111 participants were then recruited over a three-week period in May 2013. The experiment was divided into two phases. Phase I of the personality test was conducted in the laboratory. Phase II was conducted online and consisted of data collection lasting two months, from the beginning of June 2013 to the end of July 2013.

Before the Phase I test started, each subject was briefed on the content of the experiment and asked to sign a consent form. Participants were then invited to log in to their Facebook accounts and to link to the app URL used in the experiment (http://apps.facebook.com/bookroyttwo/). Next, the subject was required to give the app access to their data by clicking “OK” to proceed to the next page. After entering basic information, the subject clicked on “Start Testing” to proceed to the next page to answer questions on the personality test. After finishing the test, the subject clicked on “Next Page” to view the Facebook privacy settings questionnaire. In this questionnaire, participants were asked to answer questions about their Facebook privacy settings. An additional computer was provided so that participants could check their Facebook privacy settings simultaneously. After completing the privacy questionnaire, the subject clicked “Send”, which concluded the Phase I experiment. Subsequently, each personality test was scored and converted into the five subscales based on the established percentile rank. Based on the five different levels of feedback, scores and a short description of what the score meant were also presented to each participant. For example, those who scored in the 90^{th} percentile on extraversion were given the following feedback: “You are very extraverted, like to take the initiative to be social with others, and are optimistic and enthusiastic.”

In Phase II, the subjects were asked to log into the app each week to update their information over a two-month period. After logging in, each subject waited between one and five minutes as the app collected data on his/her weekly Facebook activity. When the subject saw the text, “Information has been updated, thank you for your help," he/she could close the window. Phase II test was independently performed by the subjects. The subjects who voluntarily granted the application permission did so knowing that it provided the investigator access to their Facebook pages and authorized the investigators to collect their data. All 111 participants voluntarily gave the investigator access to their Facebook sites.

3. Results

IBM SPSS Statistics version 17.0 was used for the statistical analyses on data reliability, correlations and differences. The reliability analysis measured both the overall reliability of the Big Five Inventory Personality Inventory and the reliability of each factor. The purpose of this

study was to investigate the patterns of Facebook users with different personalities; thus, a correlation analysis was first conducted to find correlations between subjects' personality scores and their Facebook usage time, behavior, profile content and privacy settings. To further investigate the difference between extreme personality features, difference analyses explored whether subjects with high and low degrees of each personality trait had different Facebook usage patterns. The difference analyses adopted a t-test with a classification method based on the percentile table converted from the Big Five Inventory Personality scale. The two extremes for each BFI trait were then compared (i.e., high/middle-to-high were compared to low/middle-to-low on each of the five traits). This method compared the differences between the high/middle-to-high and the low/middle-to-low extremes of the five personality traits with respect to Facebook usage time, behavior, profile content and privacy settings.

3.1 Reliability analysis of the BFI

Cronbach's alpha (the reliability coefficient), which is a measure of internal consistency, was used to estimate the reliability of the personality scale in the study. That is, we can estimate the reliability of test scores by measuring the internal consistency of items on a scale and the interrelatedness of a sample of test items. The coefficient alpha can range in value from 0 (no consistency) to 1 (complete consistency). Based on Fornell and Larcker (1981), a coefficient alpha of 0.6 is considered to indicate a reliable set of items; correspondingly, a coefficient alpha below 0.6 suggests poor scale reliability. In the study, we obtained Cronbach's alpha values of 0.753 for extraversion (8 questions), 0.651 for agreeableness (9 questions), 0.811 for conscientiousness (9 questions), 0.795 for emotional stability (8 questions) and 0.841 for openness to experience (10 questions). The overall reliability coefficient was 0.745. The results showed that all test items reached an internal consistency value above 0.6 (Cronbach's alpha) and, therefore, indicated acceptable reliability for the Big Five Inventory personality scale.

3.2 Correlation analysis

Facebook usage behaviors

With respect to the correlation between personality and Facebook usage behaviors, extraversion had significantly positive correlations with the number of likes and messages; conscientiousness had a significantly positive correlation with the number of managed groups; and openness to experience had significantly positive correlations with the number of posts, comments and profile photos. No significant correlations were found between agreeableness and usage behaviors or between emotional stability and usage behaviors. People with extraversion and openness to experience were more inclined to use Facebook features to interact with their friends. Conscientious people managed a relatively high number of groups, which is likely due to having a personality trait that prioritizes responsibility (Table 3).

Table 3 Correlation between Facebook usage behavior and personality (N = 111).

Number of:	Extraversion	Agreeableness	Conscientiousness	Emotional Stability	Openness to Experience
Posts	.081	-.010	.055	.092	.191*

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Comments	.109	-.034	.026	.081	.214*
Likes	.194*	-.008	.049	-.048	.095
Messages	.222*	-.065	.010	-.039	-.055
Profile photos	.117	.064	-.035	.008	.215*
Cover photos	.167	.043	-.158	-.108	.140
Groups	.116	.061	.133	-.008	-.005
Managed groups	.118	.068	.197*	-.029	.148
Events	.149	.046	.006	-.172	.001
Events held	.175	.179	-.006	-.100	.007
Notes	-.043	-.107	-.153	-.103	.074

*p < 0.05, **p < 0.01, ***p < 0.001

Profile content

Extraversion had a significantly positive correlation with number of friends, which is consistent with the extraversion hypothesis and with previous findings that extroversive people socialize well and have a relatively high number of friends online and offline. Agreeableness had significant positive correlations with the number of photo/video tags, check-ins and checked-ins. This result indicates that people with the agreeableness trait often interact with friends in real life and share their real-life activities online. Emotional stability had a significantly negative correlation due to the addition of family and relatives, and past studies have shown that people with lower emotional stability are more inclined to disclose their personal information. Emotional stability had insignificant correlations with other items, such as level of education, the number of work edits and the number of words in the "About me", "Quote" and basic information sections on Facebook. However, the correlations were negative, indicating that the study subjects with low emotional stability were indeed prone to disclosing their personal information on Facebook. Openness to experience and conscientiousness showed no correlations with Facebook profile content (Table 4).

Table 4 Correlations between Facebook profile contents and personality (N = 111).

	Extraversion	Agreeableness	Conscientiousness	Emotional Stability	Openness to Experience
Number of education and work edits	.151	-.097	.052	-.037	-.005
Adding family and relatives	.095	.050	.064	-.188*	.091
Number of words in the "About me" section	.136	-.079	-.048	-.047	.114
Number of words in the "Quotes" section	.033	.046	-.014	-.179	-.041
Number of residential location edits	-.092	-.139	-.016	.025	.021
Number of words in the basic	.018	.036	.007	-.165	.125

information section					
Number of words in the "Contact" section	-.061	-.072	.044	.000	-.086
Number of friends	.189*	.060	.051	-.090	.082
Number of photo/video tags	.145	.225*	-.073	-.140	.015
Number of uploaded photos	.101	.132	-.089	-.104	.158
Number of photo albums	.104	.107	-.071	-.138	.071
Number of check-ins and checked-ins	.070	.233*	-.067	-.065	-.002
Number of fan page "Likes"	-.032	.060	.047	-.083	.035

*p < 0.05, **p < 0.01, ***p < 0.001

Privacy settings

Extraversion had significantly positive correlations with "Who can add things to my Timeline?" and "Who can see my stuff?" Such findings indicate that people with extraversion are conservative with their privacy settings for these two items, and they may be attributed to extraverts' use of Facebook as a platform to interact with their real-life friends instead of strangers. Agreeableness showed no correlation with Facebook privacy settings. Conscientiousness had significantly positive correlations with four factors: "Who can see my stuff?"; "Who can see things on my timeline?"; "Who can see posts I have been tagged in on my timeline?"; and "Who can look me up?" These correlations corroborate the hypothesis that people with conscientiousness are cautious about disclosing private information on Facebook. Emotional stability and openness to experience showed no correlations with Facebook privacy content (Table 5).

Table 5 Correlation between Facebook privacy settings and personality (N = 111).

	Extraversion	Agreeableness	Conscientiousness	Emotional Stability	Openness to Experience
Who can see my stuff?	.145	-.007	.240*	-.023	.089
Who can add things on my timeline?	.191*	-.013	.071	-.036	.068
Who can see things on my timeline?	.200*	-.093	.250**	-.003	.077
Who can see posts I have been tagged in on my timeline	.170	.022	.227*	-.012	.093
Who can see what others post on my timeline ?	.180	.007	.172	.008	.000
Who can look me up?	.167	.073	.188*	-.051	.177
Do you want other search engines to link to your timeline?	-.068	.145	-.020	.009	.177
Limit the audience for posts on my timeline	.060	.004	.089	-.098	.133
Number of blocked users	.061	-.122	.129	-.078	-.023

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Number of blocked users on apps	.133	-.095	.075	-.162	-.001
Number of blocked users on events	.123	.034	.092	-.049	-.053
Number of blocked apps	.154	-.095	-.100	-.106	.065

*p < 0.05, **p < 0.01, ***p < 0.001

3.3 Difference analysis

The data that fell below the 19th percentile and above the 80th percentile for each personality trait were used in t-tests to analyze differences in Facebook usage behavior, profile contents and privacy settings.

Facebook usage behavior

The subjects with high extraversion had significantly more comments, photo likes, comment likes, likes, and messages than those with low extraversion. The users with high conscientiousness managed significantly more groups than did those with low conscientiousness. The subjects with low emotional stability had significantly more events than did those with high emotional stability. The users with high openness to experience exhibited significantly more posts, comments and cover photos than did those with low openness to experience. The users with high agreeableness did not show any differences in their Facebook usage behaviors compared to those with low agreeableness (Table 6). The means and standard deviations on Facebook usage behaviors across personality traits are shown in Table 7.

Table 6 The results of t-tests on Facebook usage behaviors among subjects with different personality traits.

	Extraversion	Agreeableness	Conscientiousness	Emotional Stability	Openness to Experience
	t	t	t	t	t
Posts	-.490	.125	-.775	-1.145	-2.010*
Comments	-2.581*	.410	-.222	-1.153	-2.332*
Likes on photo albums	-1.883	-.175	-.368	.540	-.036
Likes on photos	-2.916**	.678	-.203	.960	.209
Likes on comments	-3.003**	.241	-.920	-.184	-1.808
Likes on posts	-1.258	.372	.081	.039	-.156
Likes	-3.097**	.478	-.697	.242	-1.186
Messages	-2.052*	.549	-.279	.563	.728
Number of profile photos	-1.039	.078	.561	.206	-1.866
Number of cover photos	-1.755	-.472	1.284	.812	-2.143*
Number of groups	-1.878	.155	-1.298	.311	.321
Number of managed groups	-1.228	.538	-2.469*	.491	-1.081
Number of events	-1.800	-.362	-.196	2.658*	-.451

Number of events held	-1.720	-1.695	-.177	1.500	.184
Number of notes	.218	.489	1.808	-.318	-1.544

*p < 0.05, **p < 0.01, ***p < 0.001

Table 7 The means and standard deviations of Facebook usage behaviors among subjects with different personality traits.

	Extraversion		Agreeableness		Conscientiousness		Emotional Stability		Openness to Experience	
	High	Low	High	Low	High	Low	High	Low	High	Low
Posts	60.65 (39.92)	47.1 (30.05)	53.67 (30.63)	57.42 (40.86)	56.3 (37.81)	48.64 (28.17)	55 (37.09)	48.08 (28.72)	**58.06 (37.18)**	**48.36 (29.5)**
Comments	**189.43 (164.78)**	**115.9 (261.95)**	160.81 (151.34)	193.37 (411.75)	178.52 (322.49)	132.31 (147.81)	170 (325.06)	141.15 (172.76)	**262.06 (411.27)**	**108 (112.76)**
Likes on photo albums	5.53 (7.78)	3.78 (5.86)	4.92 (6.58)	3.78 (6.41)	5.41 (8.74)	3.61 (4.34)	3.65 (4.11)	5.2 (8.11)	4.21 (6.41)	4.77 (7.04)
Likes on photos	**107.98 (113.15)**	**67.73 (84.71)**	86.06 (69.43)	73.4 (96.99)	89.75 (112.72)	66.62 (72.87)	69.59 (77.43)	90.87 (91.9)	76.33 (73.91)	84.97 (100.54)
Likes on comments	**107.5 (121.47)**	**52 (146.78)**	93.42 (113.35)	95.16 (196.49)	95.86 (143.99)	64.83 (95.37)	72.29 (122.03)	93.28 (143.61)	137.12 (195.2)	58.55 (101.83)
Likes on posts	23.26 (25.46)	16.68 (17.41)	18.12 (15.89)	17.86 (19.26)	19.64 (25.01)	17.27 (17.16)	16.95 (16.98)	20.98 (19.84)	16.62 (15.21)	18.39 (18.5)
Likes	**244.26 (239.26)**	**140.18 (198.85)**	202.52 (168.34)	190.2 (260.31)	210.66 (244.55)	152.32 (146.48)	162.48 (166.54)	210.33 (235.49)	234.29 (238.34)	166.68 (196.8)
Messages	**1180.58 (506.1)**	**881.73 (459.68)**	1145.56 (484.89)	1065.49 (567.15)	1071.98 (460.37)	1009.96 (537.74)	1079.49 (584.35)	1010.88 (466.26)	1079.95 (522.53)	1065.15 (539.5)
Number of profile photos	13.3 (11.09)	10.39 (10.22)	13.89 (9.21)	10.72 (12.17)	12.52 (12.43)	12.76 (12.65)	12.98 (14.22)	12.28 (10.34)	16.22 (14.1)	11.04 (10.99)
Number of cover photos	4 (5.07)	1.9 (1.95)	3.73 (4.63)	2.86 (4.34)	2.82 (3.9)	3.46 (5.06)	2.61 (3.17)	2.91 (4.67)	**4.12 (4.89)**	**2.64 (3.71)**
Number of groups	21.88 (10.81)	18.86 (11.08)	22.98 (11.36)	20 (10.91)	22.8 (12.41)	19.57 (9.82)	21.18 (11.15)	19.95 (10.95)	21.34 (11.7)	21.81 (12.17)
Number of managed groups	3.2 (2.49)	2.49 (2.72)	3.58 (2.98)	2.93 (2.95)	**3.55 (2.5)**	**2.83 (3.14)**	3.03 (2.68)	2.74 (2.47)	3.72 (3.16)	3.05 (2.69)
Number of events	37.4 (30.74)	24.88 (20.69)	36.96 (27.11)	30.07 (28.23)	31.11 (28.39)	30.17 (25.01)	**29.59 (24.92)**	**32.91 (27.85)**	33.83 (26.96)	35.06 (29.48)
Number of events held	2.25 (2.58)	0.82 (1.93)	2.42 (2.9)	0.93 (1.96)	1.27 (1.95)	1.37 (2.47)	0.95 (1.96)	1.63 (2.16)	1.76 (2.38)	1.62 (2.79)
Number of notes	0.85 (1.96)	1.06 (3.16)	0.96 (2.46)	1.59 (3.46)	0.8 (2.95)	1.22 (2.65)	0.79 (1.81)	1.72 (3.86)	1.56 (3.49)	0.66 (1.95)

Note. Bold numbers indicate statistically significant values ($p \leq 0.05$).

Profile content

Users with high extraversion had significantly more friends and tagged photos/videos was higher than that of the users with low extraversion. The number of check-ins and checked-ins of the users with high agreeableness were significantly higher than those of the users with low agreeableness. The users with low emotional stability edited their family and relatives significantly more frequently than the users with high emotional stability. The number of uploaded photos of the users with high openness to experience was significantly higher than that of those with low openness to experience. There was no difference in the profile contents of the users with high versus low conscientiousness (Table **8**). The means and standard deviations on profile content for users with different personality traits are shown in Table **9**.

Table 8 The results of t-tests on Facebook profile contents among subjects with different personality traits.

	Extraversion	Agreeableness	Conscientiousness	Emotional stability	Openness to experience
	t	t	t	t	t
Number of education and work edits	-1.046	-.116	-.544	.543	.625
Adding family and relatives	-1.467	.298	-.314	2.102*	-1.042
Number of words in the “About me” section	-1.448	.997	1.372	-.291	-1.288
Number of words in the “Quotes” section	-.152	-.709	.343	1.471	.330
Number of residential location edits	.735	.878	.162	-.062	.129
Number of words in the basic information section	-.162	-1.185	-.521	1.750	-1.119
Number of words in the “Contact” section	.447	1.189	-.585	-.805	.595
Number of friends	-2.549*	-.203	-1.280	1.530	-.433
Number of photo/video tags	-2.253*	-.533	1.470	-.126	-1.978
Number of photos uploaded	-1.418	-.767	1.118	.214	-2.214*
Number of photo albums	-1.654	-1.045	.585	.905	-1.214
Number of check-ins and checked-ins	-1.067	-2.375*	.928	.113	.031
Number of fan page likes	-.694	-1.765	-.288	1.629	.068

*p < 0.05, **p < 0.01, ***p < 0.001

Table 9 The means and standard deviations of profile content data among subjects with different personality traits.

	Extraversion		Agreeableness		Conscientiousness		Emotional Stability		Openness to Experience	
	High	Low	High	Low	High	Low	High	Low	High	Low
Number of	1.23	1.12	1.13	1.19	1.11	1.11	1.22	1.16	1.12	1.3

education and work edits	(0.77)	(0.83)	(0.79)	(0.82)	(0.81)	(0.8)	(0.85)	(0.78)	(0.8)	(0.81)
Adding family and relatives	0.75 (0.44)	0.71 (0.46)	0.84 (0.37)	0.72 (0.45)	0.77 (0.42)	0.72 (0.46)	**0.71 (0.46)**	**0.84 (0.37)**	0.83 (0.38)	0.77 (0.43)
Number of words in the "About me" section	5.25 (13.9)	2.32 (5.86)	2.07 (5.56)	3.73 (8.68)	3.72 (8.18)	2.49 (7.27)	4.36 (9.49)	4.48 (12.9)	5.31 (10.25)	1.58 (4.56)
Number of words in the "Quotes" section	1.85 (4.04)	1.98 (6.14)	2.18 (5.52)	1.98 (4.14)	2.59 (6.77)	1.8 (4.38)	1.34 (3.61)	2.72 (6.74)	1.95 (4.16)	1.92 (5.34)
Number of residential location edits	0.93 (0.94)	1 (0.89)	1 (0.95)	1.12 (0.91)	0.91 (0.96)	0.93 (0.85)	1.02 (0.91)	1 (0.93)	0.98 (0.95)	1.02 (0.92)
Number of words in the basic information section	2.68 (0.92)	2.65 (0.93)	2.84 (0.98	2.67 (0.81)	2.7 (1)	2.7 (0.89)	2.68 (0.79	2.84 (1)	2.86 (0.93)	2.68 (0.96)
Number of words in the "Contact" section	1.03 (0.36)	1.04 (0.2)	1.04 (0.21)	1.09 (0.37)	1.07 (0.25)	1.02 (0.26)	1.05 (0.31	1.09 (0.29)	1 (0.31)	1.09 (0.28)
Number of friends	**402.38 (159.92)**	**342.82 (158.31)**	415.27 (157.23)	374.05 (172.31)	377.59 (153.88)	360.98 (153.01)	376.95 (155.02	365.4 (138.69)	413.02 (197.55)	378.87 (133.76)
Number of photo/video tags	**214.45 (147.79)**	**169.55 (144.34)**	246.53 (143.66)	153.12 (127.62)	189.8 (147.82)	192.37 (142.31)	181.51 (139.79	217.14 (150.84)	212.29 (143.3)	189.64 (143.07)
Number of photos uploaded	601.2 (833.2)	308.76 (430.18)	724.58 (992.63)	407.16 (837.45)	458.89 (764.74)	544.8 (956.89)	427.8 (735.58	597.56 (947.78)	**767.43 (1142.34)**	**354.57 (578.13)**
Number of photo albums	19.08 (15.27)	14.18 (10.21)	20.29 (15.47)	14.82 (11.55)	16.3 (11.72)	15.93 (14.16)	15.28 (9.85	18.79 (16.84)	20.68 (15.09)	14.77 (10.2)
Number of check-ins and checked-ins	121.25 (74.02)	99.27 (74.8)	**131.09 (78.94)**	**83.19 (61.69)**	101.09 (71.3)	100.63 (68.64)	105.34 (71.45	113.74 (73.25)	114.05 (71.72)	103.98 (74.55)
Number of fan page likes	20.23 (4.64)	19.92 (4.85)	20.91 (4.08)	19.16 (5.84)	19.98 (4.93)	20.2 (4.64)	19.39 (4.73)	20.65 (4.47)	19.33 (5.59)	19.89 (4.75)

Note. Bold numbers indicate statistically significant values ($p \leq 0.05$).

Privacy settings

In privacy settings ("Who can see your posts?"; "Who can see your tagged posts?" and "Who can see others' posts on your timeline?"), individuals with high conscientiousness were significantly more conservative than those with low conscientiousness. Subjects with low emotional stability blocked significantly more apps than did their peers with high emotional stability. For the "Do you want other search engines to link to you?" setting, users with high openness to experience were significantly more liberal than were subjects with low openness to experience. There was no difference between the privacy settings of subjects with high and low extraversion or agreeableness (Table **10**). The means and standard deviations for Facebook privacy settings across personality traits is shown in Table **11**.

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Table 10 The results of t-tests on Facebook privacy settings among subjects with different personality traits.

	Extraversion	Agreeableness	Conscientiousness	Emotional stability	Openness to experience
	t	t	t	t	t
Who can see your profile?	-1.598	.619	-1.941	.084	-.397
Who can post on your timeline?	-1.803	.073	-.752	-.130	.276
Who can see your posts?	-1.549	1.124	-2.560*	-.179	-.020
Who can see your tagged posts?	-1.372	-.262	-2.309*	.253	.319
Who can see others' posts on your timeline?	-1.705	.332	-2.094*	.243	.478
Who can look you up?	-1.973	.472	-1.761	.353	-1.995
Do you want other search engines to link to you?	.000	-.746	.290	-.047	-2.477*
Users blocked	-.552	.884	-.368	.708	-1.556
Number of blocked users	.208	.884	-1.120	.510	.300
Number of blocked app invites	-1.366	1.036	-1.252	1.808	-.339
Number of blocked events invites	-1.384	-.765	-.546	.792	1.073
Blocked apps	-1.533	.385	1.117	2.293*	-.847

*p < 0.05, **p < 0.01, ***p < 0.001

Table 11 The means and standard deviations of Facebook privacy settings among subjects with different personality traits.

	Extraversion		Agreeableness		Conscientiousness		Emotional Stability		Openness to Experience	
	High	Low	High	Low	High	Low	High	Low	High	Low
Who can see your profile?	2.5 (0.93)	2.08 (1.1)	2.29 (1.01)	2.19 (1.01)	2.55 (1.02)	2 (0.97)	2.02 (0.99)	2.37 (1.11)	2.48 (1.09)	2.17 (1.05)
Who can post on your timeline?	2.65 (0.83)	2.29 (1.04)	2.58 (0.89)	2.42 (1.03)	2.5 (0.93)	2.37 (0.88)	2.32 (0.91)	2.58 (1.01)	2.6 (0.91)	2.38 (0.97)
Who can see your posts?	2.6 (0.93)	2.29 (1.08)	2.4 (1.03)	2.49 (1.05)	**2.64 (0.94)**	**2.22 (1.01)**	2.32 (0.93)	2.53 (1.12)	2.62 (1.01)	2.38 (1.03)
Who can see your tagged posts?	2.55 (0.96)	2.24 (1.01)	2.42 (1.03)	2.3 (1.01)	**2.52 (1.02)**	**2.15 (0.87)**	2.24 (0.89)	2.47 (1.12)	2.57 (0.97)	2.34 (1.01)
Who can see others' posts on	2.45 (0.85)	2.16 (1.07)	2.36 (1)	2.19 (0.98)	**2.36 (0.97)**	**2.13 (0.91)**	2.2 (0.98)	2.37 (1.02)	2.38 (0.91)	2.26 (1.05)

your timeline?										
Who can look you up?	2.3 (1.29)	1.84 (1.14)	2.18 (1.35)	1.91 (1.11)	2.3 (1.29)	1.76 (1.04)	1.83 (1)	2.14 (1.32)	2.48 (1.29)	1.81 (1.17)
Do you want other search engines to link to you?	1.33 (0.47)	1.41 (0.5)	1.4 (0.5)	1.28 (0.45)	1.39 (0.49)	1.39 (0.49)	1.37 (0.49)	1.42 (0.5)	**1.45 (0.5)**	**1.32 (0.47)**
Users blocked	0.46 (1.19)	0.51 (1.4)	0.51 (1.32)	0.43 (1.26)	0.62 (1.6)	0.36 (0.97)	0.41 (1.2)	0.66 (1.57)	0.92 (1.72)	0.22 (0.86)
Number of blocked users	0.89 (1.52)	0.63 (1.17)	0.64 (1.19)	0.83 (1.36)	0.98 (1.49)	0.58 (1.24)	0.62 (1.32)	0.81 (1.3)	0.76 (1.28)	0.65 (1.24)
Number of blocked app invites	2.29 (5.98)	1.18 (3.49)	1.33 (3.7)	2.02 (5.85)	1.68 (4.4)	0.71 (2.09)	0.71 (2.29)	2.51 (6.27)	1.77 (5.27)	1.49 (4.27)
Number of blocked event invites	0.77 (2.43)	0.67 (2.18)	0.93 (2.69)	0.47 (1.78)	0.8 (2.05)	0.45 (2.06)	0.61 (2.25)	0.65 (1.89)	0.56 (1.85)	0.7 (2.31)
Blocked apps	8.57 (15.52)	3.71 (9.45)	4.91 (9.48)	6.49 (13.27)	5 (11.41)	8.15 (14.67)	**4.12 (11.08)**	**6.35 (11.84)**	7.59 (13.79)	5.72 (10.93)

Note. Bold numbers indicate statistically significant values ($p \leq 0.05$).

4. Discussion

In this study, we found that extraverted people are more inclined to use Facebook's active social features, such as likes and messages, and are likely to have more friends. Additionally, highly extraverted people are more inclined to use Facebook features such as likes, messages, likes on photos, and comments and are likely to have more Facebook friends and tagged photos/videos on their profiles than less extraverted people. Therefore, Hypotheses 1-1 and 1-2 were validated. Furthermore, Ross et al. (2009) found that highly extraverted people are associated with more friends and groups on Facebook. Ryan and Xenos (2011) also found that people with high extraversion scores are likely to be frequent users of active social Facebook features. Moore and McElroy (2012) showed that extraverts have significantly wider social networks than do introverts. In this study, extraverted people did use Facebook often to contact their friends using the site's interactive features. Therefore, the results of this study confirmed past research and corroborated the rich-get-richer hypothesis (Valkenburg & Peter, 2007). However, in comparing the results of people with high and low extraversion, we found that introverted (low extraverted) subjects were less likely to use features such as likes, messages, likes on photos, and comments and that they had fewer Facebook friends and tagged photos/videos. This finding contradicts the social compensation hypothesis (Schouten et al., 2007). It is likely that because introverted people tend to have fewer friends in real life, they are less likely to use Facebook, which is a platform intended to establish online contact with one's real-life friends. Regarding privacy settings, this study found that extraverts have more conservative timeline privacy settings than introverts (Amichai-Hamburger & Vinitzky, 2010). In other words, extraversion was found to correlate positively with "Who can add things on my timeline?" and "Who can see things on my timeline?" Subjects with high extraversion used

conservative privacy settings for these two items, likely because Facebook is a platform for these subjects to interact with real-life friends as opposed to strangers on the Internet. Therefore, Hypothesis 1-3 was invalidated.

The users who scored highly on agreeableness were friendly, helpful and well-socialized on Facebook and were skilled at using tools provided by Facebook to maintain social interaction. Ryan and Xenos (2011) found correlations between agreeableness and Facebook's active social features (likes, comments, messages, etc.) and information features (notes and events). Seidman (2013) argued that people with high agreeableness are prone to represent their true selves online. In this study, people with high agreeableness were not more likely to use Facebook's active social features; therefore, Hypothesis 2-1, which claims that those with high agreeableness are more inclined to utilize Facebook events and notes, was invalidated. Nevertheless, although the results did not find that agreeable people were more inclined to use these features, they did show that users with high agreeableness are more inclined to use the check-in feature and share their daily lives with their friends than people who score lower on agreeableness. That is, agreeableness correlated with a higher number of photo/video tags, check-ins and checked-ins. Moreover, compared to people with low agreeableness, people with high agreeableness were more inclined to make check-ins and checked-ins. Therefore, Hypothesis 2-2 was validated, although no correlation between agreeableness and the number of Facebook friends was found. Last, because agreeableness was not correlated with Facebook privacy settings, Hypothesis 2-3 was invalidated.

The study's results showed that the subjects with high conscientiousness tended to manage a relatively high number of groups, which corresponded to their traits of being task-oriented, organized and responsible. For example, compared to people with lower conscientiousness, people with higher conscientiousness were more inclined to manage groups and more conservative with respect to their privacy settings. That is, they placed more restrictions on others' ability to search for them ("who can see my stuff?") and read their posts ("who can see things on my timeline?"), profiles ("who can look me up?") and tagged posts ("who can see posts I've been tagged in on my timeline?"). Therefore, Hypotheses 3-1 and 3-3 were validated. However, the results did not show a correlation between high conscientiousness and profile content. This observation does support Moore and McElroy's finding (2012) that highly conscientious people utilize the Facebook wall feature significantly less than do other individuals. Moreover, compared to Amichai-Hamburger and Vinitzky's finding (2010), there was no evidence in the present study to indicate that people with high conscientiousness tend to have more friends on Facebook. Thus, Hypothesis 3-2, which suggested that conscientious people would decrease their Facebook usage and tend to have more Facebook friends, was invalidated.

Ross et al. (2009) and Ryan and Xenos (2011) found that people with low emotional stability enjoy browsing Facebook and spend longer periods of time on Facebook than do those with high emotional stability. Amichai-Hamburger and Vinitzky (2010) indicated that people with low emotional stability tend to share more personal information online than do those with high emotional stability, likely as a form of self-exhibition (Seidman, 2013). Sumner et al. (2011) found that low emotional stability is significantly correlated with privacy concerns. However, in the present study, unlike previous ones, no correlation was found between emotional stability and Facebook usage behavior. In other words, the results did not indicate that people with low emotional stability either made a significant number of posts, comments, and likes or had fewer Facebook friends. In addition, they were not more inclined to let others look them up or see their

profiles, postings and tagged posts than were users with high emotional stability. They also did not have more restrictive privacy setting. As a result, the three emotional stability hypotheses were all invalidated. However, we noted a few novel findings: namely, users with low emotional stability participated more frequently in Facebook events, made more frequent edits to their family members and relatives in their profiles and blocked more apps than those with high emotional stability. The tendency of users with low emotional stability to participate in events and edit their family and relatives could be related to their intent to receive more attention on the Internet. Their tendency to block apps was also likely related to their emotive personalities.

Gosling et al. (2011) showed that high openness to experience is correlated with a relatively high number of friends and uploaded photos. Ross et al. (2009) found that people with high openness to experience are highly skilled in computer-mediated communication. Amichai-Hamburger and Vinitzky (2010) indicated that people with high openness to experience use several Facebook features because they are imaginative, have broad interests and are willing to try new things, which makes them more likely to be adept with novel Facebook features. Correspondingly, the present study found that subjects with high openness to experience were relatively more inclined to post text, make comments and have more cover photos and uploaded photos, which is consistent with the finding of Gosling et al. (2011). Moreover, they were willing to allow Internet search engines link to their Facebook profile page. In contrast, subjects with low openness to experience were more reluctant to disclose their personal information and less likely to allow Internet search engines to link to their Facebook profile page. Although the three hypotheses had minor descriptors in them that were unsupported, overall, all three openness-to-experience hypotheses were validated.

One of the distinguishing features of our study is that we used an objective method to simultaneously retrieve data regarding user profile pages, usage behavior, and privacy settings on Facebook. Our results are similar to those of studies that used subjective data (Ross et al., 2009; Ryan & Xenos, 2011). Nevertheless, the present study generated new results, such as those for the agreeableness and emotional stability traits. This difference in findings might be due to people's tendencies to show conflicting attitudes or behaviors toward subjective and objective measures. There have been many studies on the relationship between users' personalities and their behavior on Facebook (Amichai-Hamburger & Vinitzky, 2010; Moore & McElroy, 2012; Ross et al., 2009; Ryan & Xenos, 2011); as elaborated in Table 12 and Table 13, our study yielded similar results to those of previous research. For instance, we synthesized evidence from the relevant literature and found that extraverts had more friends on Facebook and were more likely to use functions such as messages and wall posting. Participants with high agreeableness did not have more Facebook friends. In contrast, subjects with high openness to experience were more likely to use Facebook as a communication tool and to be more sociable by adding more posts, comments, and photos (Amichai-Hamburger & Vinitzky, 2010; Ross et al., 2009). Moreover, the present study's findings diverged from previous research. For example, Ross et al. (2009) found that people with low neuroticism prefer posting photos on their profile, and Amichai-Hamburger and Vinitzky (2010) indicated dissimilar results. Moore and McElroy (2012) found an insignificant correlation between emotional stability and number of photos. For conscientiousness, Amichai-Hamburger and Vinitzky (2010) found that people with high conscientiousness have more friends and upload fewer pictures. In contrast, Moore and McElroy (2012) indicated that conscientiousness is not related to the number of friends or photos. Furthermore, studies on the same personality measures gave very disparate results. For example, the current study found that conscientiousness is positively correlated with the number of

managed groups, but Ryan and Xenos (2011) concluded that conscientiousness is negatively correlated with the time spent on Facebook per day. Moore and McElroy (2012) argued that people with high conscientiousness make significantly fewer wall postings. Based on the above results, it is apparent that recent studies have investigated a significant relationship between extraversion, emotional stability, and social network use. Nevertheless, little evidence has been found on agreeable people and their SNS usage behavior or on people with openness to experience and their profile content on SNS. Since previous studies primarily used subjective quantitative measures, this study objectively investigated the usage patterns of Facebook users with different personalities and observed whether their social behaviors on the site reflect their offline personalities. As a result, it is arduous to consolidate all our findings presented in the context of similar previous research, so it would be inappropriate to establish a theoretical theory or a model based on the current outcomes. In summary, the behaviors exhibited by Facebook users in the present study were generally consistent with their personality traits. In other words, the online behaviors of the subjects revealed their offline personalities. Moreover, for the majority of the study's participants, Facebook was a microcosm of their actual social lives: those who were highly extraverted with high agreeableness were not only skilled at socializing in real life but also at maintaining relationships with their friends using Facebook features.

Table 12 Results comparison between current study and previous studies.

	Personality traits	The current study	Ross et al. (2009)
Facebook usage behavior	Extraversion	Positively correlated with likes and messages; people with high extraversion had more comments, messages, likes, and likes on photos and comments.	Extraverts had membership in more groups.
	Agreeableness	Those with high agreeableness had more check-ins.	-
	Conscientiousness	Positively correlated with the number of managed groups; people with high conscientiousness managed more groups.	-
	Emotional stability	Low emotional stability users had more events.	People with high neuroticism preferred using Facebook.
	Openness to experience	Positively correlated with the number of posts, comments, and profile photos; high openness to experience users had more posts, comments, and cover photos.	People with high openness to experience were associated with greater tendency to be sociable on Facebook.
Profile content	Extraversion	Positively correlated with number of friends; people with high extraversion had more friends and photo/video tags.	Extraverts were not related to number of friends.
	Agreeableness	Positively correlated with number of photo/video tags and check-ins.	More agreeable users did not have more online contact.
	Conscientiousness	-	-

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	Emotional stability	Negatively correlated with adding family and relatives; low emotional stability users were more likely to edit family/ relatives information.	Those with low neuroticism preferred posting photos on their profiles.
	Openness to experience	People with high openness to experience uploaded more photos.	
Privacy settings	Extraversion	Positively correlated with "Who can see things on my timeline?" and "Who can add things on my timeline?"	-
	Agreeableness	-	-
	Conscientiousness	Positively correlated with "Who can see my stuff?", "Who can see things on my timeline", "Who can see posts I've been tagged in on my timeline" and "Who can look me up?"; people with high conscientiousness were more conservative with privacy settings.	-
	Emotional stability	Low emotional stability users blocked more apps.	-
	Openness to experience	High openness to experience users were more liberal on “Do you want other search engines to link to you?”	-

Table 13 Results comparison between current study and previous studies (continued).

	Personality traits	Amichai-Hamburger and Vinitzky (2010)	Ryan and Xenos (2011)	Moore and McElroy (2012)
Facebook usage behavior	Extraversion	Most and least extraverted groups had no significant differences in joining groups.	Positively correlated to chat, messages, comments, and wall postings.	Not significantly related to time spent on Facebook, number of photos, or wall postings.
	Agreeableness	-	-	-
	Conscientiousness	-	Negatively correlated with the time spent on Facebook per day.	People with high conscientiousness made significantly fewer wall postings.
	Emotional stability	-	Positively correlated to time spent on Facebook per day, and wall usage.	People with high neuroticism spent more time on Facebook; positively related to how frequently users use Facebook.

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	Openness to experience	People with high openness to experience were expected to be more willing to use Facebook as a communication tool.	-	Openness to experience had no significant effect on either Facebook usage or content.
Profile content	Extraversion	Extraverts had more friends.	-	Extraverts had more friends.
	Agreeableness	More agreeable users did not have more friends.	-	-
	Conscientiousness	People with high conscientiousness had more friends and uploaded fewer pictures.	-	Conscientiousness was not related to time spent, frequency of use, number of friends, or number of photos.
	Emotional stability	People with high neuroticism preferred posting photos on their Facebook profiles.	-	Emotional stability was not related to the number of friends, photos, or wall postings.
	Openness to experience	-	-	Openness to experience had no significant effect on Facebook usage or content.
Privacy setting	Extraversion	-	-	-
	Agreeableness	-	-	-
	Conscientiousness	-	-	-
	Emotional stability	-	-	-
	Openness to experience	-	-	-

5. Conclusion

To obtain more objective data than the subjective measures collected in previous research on Facebook usage, the present study collected Facebook usage data via an app. In addition to making statistical analyses of our data, we observed subjects' personalities in-depth to reveal more subtle and comprehensive usage phenomena. The results of the present study are generally consistent with those of previous studies, with additional findings noted. In Facebook usage behavior, people with extraversion and openness to experience are more inclined to use Facebook features, and people with conscientiousness are more likely to manage Facebook

groups. In profile content, the subject groups for extraversion, agreeableness, and emotional stability each showed some correlation with features like numbers of friends and photo/video tags. Regarding privacy, this study's extraverted subjects used Facebook as a platform to interact with their real-life friends and were less interested in Facebook interaction with strangers. In addition, subjects with low emotional stability had higher levels of event participation, family and relative edits and blocked apps than those with high emotional stability.

Despite these additional findings, this research has limitations. During the experiment, participants were able to view the results of their personality questionnaire after finishing the test. This feedback could have caused bias or influenced their subsequent behavior on Facebook in the following weeks. In addition, gender and Facebook experience, which have a significant effect on Facebook usage (Moore & McElroy, 2012), were not taken into account. Women spend more time, have more friends, and post more photos on Facebook than men do. Moreover, users with more Facebook experience also showed similar results. Thus, it is possible that factors such as gender and Facebook experience influenced this study's results. Another limitation is the data collection period. As mentioned above, data collection lasted two months (June and July 2013) and straddled the halfway point and the end of the semester for universities in Taiwan. Thus, we can deduce that the academic calendar may have affected university students' Facebook usage behavior. For example, they might have been less active on social media at the end of the semester and more active during vacations. Correspondingly, the present study was based on data derived exclusively from university students; therefore, its generalizability to all Facebook users is limited.

In future studies, it is recommended that investigators conduct more long-term experiments to discover whether the behavior of Facebook users with different personality traits changes over time. In this study, the age range of the subjects (18-25 years) allowed behavioral observations of the personalities of this age group. In the future, additional age groups, such as adolescents, middle-aged people and the elderly, should be studied to enable comparisons between users of all ages with different personality traits. Compared with young adults, adolescence is a critical stage during which young people develop self-esteem and care about their self-image. Moreover, adolescents with different personality traits may have diverse self-presentation strategies on Facebook. Moreover, online age restrictions matter: Facebook requires users to be at least 13 years old before they can create an account. Thus, social networking systems research on adolescent Facebook usage behavior should consider these age limits. Furthermore, studies have confirmed a continuous change of personality throughout middle and later adulthood (Caspi & Roberts, 2001; Staudinger & Kunzmann, 2005). In addition, different age groups have different attitudes about technology; for example, elderly people are likely to have technology anxiety (Renaud & Van Biljon, 2008). Consequently, it is crucial to understand the effects of personality on Facebook usage for different ages. Furthermore, as mentioned above, subjective measures could also be taken into account in future studies. In addition to collecting objective data, future studies might use subjective measures for comparison. For example, researchers might conduct interviews or analyze the textual content of posts by people with different personalities to examine the relationships between personality and the positive and negative words in users' posts. Moreover, more studies might focus on personality disclosure on social network sites. It is likely that such studies would find consensus on SNS usage behavior across different personalities. Finally, it is recommended that future studies develop a conceptual diagram or guideline for the impact of certain personality traits on the use of social network services.

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- This study objectively investigated the usage patterns of Facebook users with different personalities.
- This study objectively observed whether users' social behaviors on the site reflect their offline personalities.
- A Facebook app - the graph application programming interface (API) - was used to acquire the subjects' usage behavior data.
- The collected data consisted of profile content, usage behavior and privacy settings
- This study generated new results, such as those for the agreeableness and emotional stability traits.

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