



# Capturing personality from Facebook photos and photo-related activities: How much exposure do you need?



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## ABSTRACT

Photo-related activities are noticeably prevalent among social media users. On Facebook, users predominantly communicate visually and manage their self-presentation. Such online behaviours tend to mimic what would be expected of individuals' offline personalities. This study sought to address the link between Facebook users' photo-related activities and the Big Five personality traits by encoding basic Facebook visual features. Content analysis on the actual profiles ( $n = 115$ ) and multiple regression analyses revealed many associations as a manifestation of users' characteristics. For instance, Neuroticism and Extraversion predicted more photo uploads. Conscientiousness was predictive of more self-generated albums and video uploads and Agreeableness predicted the average number of received 'likes' and 'comments' on profile pictures. Additionally, the Facebook experience in interaction with the personality factors was found to be influential on the type of photo-related activity and the level of photo participation of users. The findings provide evidence that Facebook users with various personality traits set up albums and upload photos differently. Given the uses and gratification model, users adapt the construction of their profiles and manage their interactions to gratify their psychological needs on Facebook.

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## 1. Introduction

Online social networking has emerged globally as an indispensable part of everyday life (Boyd & Ellison, 2007; Dutton, Blank, & Groselj, 2013; Hampton, Sessions Goulet, Rainie, & Purcell, 2011). According to a recent national survey in Britain, the rate of posting photos online has increased from 53% in 2011 to 64% in 2013 and looking at photos has become the most frequent online leisure activity, surpassing listening to music (Dutton et al., 2013). Among social media, Facebook is now the biggest and fastest growing photo-sharing site (Rainie, Brenner, & Purcell, 2012), with a daily uploading rate of over 219 million photos (Facebook newsroom, 2013). Although few studies have examined online photo-related activities, some previous literature has confirmed Facebook photos as a practical and informative means of interpreting self-image, interpersonal impressions, and identity management (Mendelson & Papacharissi, 2010; Pempek, Yermolayeva, & Calvert, 2009; Saslow, Muise, Impett, & Dubin, 2013; Siibak, 2009; Tosun, 2012; Van Der Heide, D'Angelo, & Schumaker, 2012).

Online behaviours tend to mimic what would be expected of an individual's offline personality characteristics. Thus, one area of

research which needs attention is the study of individual differences, chiefly personality, in online environments (Orchard & Fullwood, 2010; Orchard, Fullwood, Galbraith, & Morris, 2014). The main purpose of this study is therefore to examine the link between Facebook users' level of photo participation and photo-related activities and their Big Five personality traits. The Big Five is a well-researched model measuring Extraversion, Agreeableness, Conscientiousness, Neuroticism and Openness (Goldberg, 1999; Goldberg et al., 2006; John & Srivastava, 1999).

Based on the uses and gratification theory, as a psychological communication paradigm, individuals are aware of their needs and motivations in mass media use. This model asserts that people make their own decisions about which type of communication platform they prefer to use and a large number of social and psychological factors come into play when they make their choices (Katz, Blumler, & Gurevitch, 1974; Rubin, 2002). As motivations are driving forces to perform actions and psychological dispositions reinforce certain behaviours in gratifying desires, different people with varying psychological and emotional states, are motivated by different needs and wants, which can be gratified in numerous ways via engagement with mass media (Nabi, Finnerty, Domschke, & Hull, 2006). The uses and gratification model has successfully been applied to studying online content creation in user-generated media such as Facebook, Twitter and

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blogs (Chen, 2011; Cheung, Chiu, & Lee, 2011; LaRose & Eastin, 2004; Smock, Ellison, Lampe, & Wohn, 2011).

Social Networking sites (SNSs) like Facebook are not homogeneous environments and they offer a toolkit of features. Thus, users are able to perform specific actions and generate particular content such as posting photos, videos and status updates to meet their individual motivations and desires (Smock et al., 2011). Facebook provides a valuable sphere to study communication and psychological phenomena in both experimental and naturalistic settings (Wilson, Gosling, & Graham, 2012). However, despite this novel potential, there is limited research, which has explored the visual communication of users.

We examined the photo-related activities under two aspects of Facebook profile content. First, the basic visual features which are solely created by the profile owner, including six items of information; the total number of uploaded photos, self-generated albums, cover photos, profile pictures, videos and the average number of uploaded photos per album. Second, those aspects of the profile that represent the online interactions of the users with their friends, including four items of information; total number of tagged photos, average number of received 'likes' and 'comments' on profile pictures and number of Facebook friends.

### 1.1. Primacy of the visual communication on Facebook

Primacy of the visual or visual culture is an integral component of modern social life; pictures are everywhere (Rose, 2007). Since its invention, photography has been an influential tool for communication and identity formation. In recent decades, with the ubiquity of digital cameras, the social application of personal photography has shifted from focusing on family events to more personal aspects of life and from a method for recording and documenting life events to a method of sharing personal experiences (Van Dijck, 2008). Nowadays, simultaneous observation of photos and videos are easily possible via the Internet.

From using an ethnographic approach, self-presentation and identity formation have become the main function of personal photography and the 'Net' generation tend to use digital photos as an influential communication and identity construction tool. "Pixelated images, like spoken words, circulate between individuals and groups to establish and reconfirm bonds" (Van Dijck, 2008, p. 6). In terms of online social life, Facebook photos seem to be an indispensable part of self-presentation and impression management through which users communicate visually (Siibak, 2009).

Seven years from launching, about 265 billion photos have been uploaded on Facebook (Facebook newsroom, 2012, 2013). Previous limitations have been eliminated and new visual friendly functions introduced. Two examples are the 'photo sync' (in which photos are automatically uploaded in a private default album with greater ease and speed for sharing) and the 'graph search' (which enables users to find the uploaded images from a city or from an event for instance). Additionally, new tagging facilities encourage users to tag more photos. To persuade users, the site employs various communication strategies from sending screen messages like 'photos are better with friends' and asking questions like 'who were you with?' suggesting the friends' name to be tagged via 'facial recognition software' in which a pre-designed template of ones' face will be automatically matched with the newly uploaded photographs (Armbrust, 2012; Facebook newsroom, 2013).

Facebook users mainly engage in implicit identity performance and they prefer to "show rather than tell" (Zhao, Grasmuck, & Martin, 2008). Pictures may influence impressions more strongly than words and may reveal supplementary clues about users' personality and social orientations (Van Der Heide, D'Angelo, & Schumaker, 2012). This could be one main reason that posting

photos is one of the most-loved activities on Facebook (Wilson et al., 2012).

### 1.2. Users' characteristics and online visual presence

A large number of previous studies have taken the uses and gratification approach to define the motivational factors of users' Internet engagements based on psychological needs and the gratifications they seek (see Orchard & Fullwood, 2010 for a review). Nadkarni and Hofmann (2012) in a recent review proposed a dual factor model of Facebook use. They suggested that users are motivated to use Facebook in order to fulfil two primary needs of belongingness and self-presentation. However, due to the changing nature and huge popularity of SNSs like Facebook, many new factors have emerged and should be addressed in the light of individual differences, namely, personality. For example new communication features of the Facebook timeline perform a new function for the profiles as a nostalgic visual online diary that seems to be kept forever (Orchard et al., 2014).

Past literature has investigated the manifestation of hidden characteristics on Facebook behaviours. Findings show that users with high levels of Narcissism and low levels of self-esteem post more self-promotional content such as manipulated photos to look more attractive (Mehdizadeh, 2010). Particularly, online photo-sharing has been shown to be strongly related to appearance contingency for self-worth (Stefanone, Lackaff, & Rosen, 2011). Not surprisingly, shy users reported having fewer friends, whereas they spend more time on Facebook because they find this online space more appealing in comparison to more outgoing users (Orr et al., 2009). This is consistent with the social compensation theory since Computer Mediated Communication (CMC) enables users to compensate for face to face communication difficulties (Zywica & Danowski, 2008).

### 1.3. Big Five personality and Facebook visual presence

In several studies on individual differences, personality factors are highlighted as leading factors in determining life preferences and interaction styles employing a number of different theories; among them, the five-factor model of personality is a well-accepted model (Goldberg et al., 2006). A considerable amount of Cyberpsychology and CMC literature has reported the predictive power of this model (e.g. Amichai-Hamburger & Vinitzky, 2010; Bachrach, Kosinski, Graepel, Kohli, & Stillwell, 2012; Seidman, 2013; Wilson et al., 2012), hence its applicability in this particular study.

#### 1.3.1. Extraversion and Facebook

In every day communications, we easily distinguish high Extraverts by their outgoing, talkative, and energetic disposition, which is opposite to Introverts who are shy, quiet and reserved. Extraverts do not mind being the centre of attention (John & Srivastava, 1999; McCrae & Costa, 1997). Extraversion seems to be the least debatable trait to predict Facebook usage, although there are some contradictory research findings. Ross et al. (2009) found no relationship between this trait and Facebook communicative features such as photo sharing or having more Facebook friends, but from their relatively small sample, high Extraverts reported membership in numerous Facebook groups. On the other hand, a content analysis study on actual profiles confirmed this association with higher number of Facebook friends, but not uploaded photos (Amichai-Hamburger & Vinitzky, 2010). Employing 'big data' via an application called 'myPersonality', the positive association of Extraversion and number of Facebook contacts was confirmed (Bachrach et al., 2012; Quercia, Lambiotte, Stillwell, Kosinski, & Crowcroft, 2012). Extraverts report engagement in

more self-presentation activities such as posting photos and status updates (Ong et al., 2011), and demonstrate addictive tendencies towards Facebook use (Wilson, Fornasier, & White, 2010). Extraversion is also positively related to the use of the Facebook communicative features such as 'comments' and status updates (Ryan & Xenos, 2011).

Conversely, highly Introverted individuals are inclined towards high levels of Internet usage with the preference for anonymous online communication platforms like chat rooms and forums where they have limited interactions, however high Extraverts prefer SNSs to have unlimited contact with their friends to gratify their need to socialize. Whilst they particularly enjoy the company of others in the offline world, they may see Facebook as an additional communication venue for maintaining and advancing their friendship networks (Orchard & Fullwood, 2010). Being unrestrained, Extraverts engage in self-disclosure to a larger extent on Facebook profiles (Chen & Marcus, 2012). Consequently, we offer the hypothesis (H1) that there will be a positive relationship between the user's level of Extraversion and number of photos uploads on Facebook. As outgoing and expressive individuals, we expect Extraverts may take relatively more photos from life events in social contexts and they will upload a large number of them to keep connections and visually communicate with their Facebook friends.

### 1.3.2. Neuroticism and Facebook

Neuroticism is characterised by a temperamental nature, being prone to stress and anxiety. On the other pole, Emotionally Stable individuals feel relaxed, secure and confident most of the time (John & Srivastava, 1999; McCrae & Costa, 1997). Highly Neurotic Facebook users avoid posting photos and prefer 'wall' (i.e. the original profile space containing the users' content) features to have a better control over personal identifying information (Ross et al., 2009). On the contrary, Amichai-Hamburger and Vinitzky, 2010 demonstrated that highly Neurotic users upload significantly more self-photos, whereas they are less inclined to share other types of photos generally. Findings of another study on wall posting and regret suggest that such individuals are inclined to gain acceptance and grow their social contact via Facebook; however, from this self-report study no associations with the number of friends or uploaded photos were found (Moore & McElroy, 2012). Neuroticism is the best predictor of belongingness-related behaviours and motivations as well as self-presentation needs on Facebook. More specifically, it has been shown that highly Neurotic users actively engage in general self-disclosure, emotional disclosure, and presentation of actual, ideal, and hidden self-aspects on their profiles. Facebook may be viewed as a safe place for self-expression which allows users to compensate for their offline deficiencies (Seidman, 2013). Thus, these results can also be explained with reference to social compensation theory (Zywica & Danowski, 2008). Therefore, we propose the following hypothesis (H2): Facebook users with high levels of Neuroticism will upload more pictures as a strategy to seek social support and gain popularity online to fulfil the two central needs of self-presentation and belongingness, which are less likely to be gratified offline.

### 1.3.3. Agreeableness and Facebook

Agreeableness is associated with being warm and sympathetic, and is the opposite of disagreeableness, which is associated with people who are cold and selfish (John & Srivastava, 1999; McCrae & Costa, 1997). High scorers on Agreeableness are concerned about what other people may think of them and therefore tend to adopt a friendlier disposition. They are less competitive, argumentative and are good team members (John & Srivastava, 1999). A hypothesis that highly Agreeable users have more Facebook friends was rejected in both early studies on the relationship between the Big Five and Facebook behaviours (Amichai-Hamburger & Vinitzky,

2010; Ross et al., 2009). Unexpectedly, it was found that both high and low Agreeable Facebook users uploaded significantly more photos than moderate scorers. This finding highlights the leading role of personality in determining Facebook users' visual contribution and stresses how such puzzling associations require further research, focusing on certain communicational features (Amichai-Hamburger & Vinitzky, 2010). As highly Agreeable users are more concerned with being liked, they may take more care over the manner in which they manage their self-presentation. They talk about themselves generally in positive terms and avoid negative issues, hence demonstrating impression management tactics (Fullwood, Nicholls, & Makichi, in press; Gill, Nowson, & Oberlander, 2009). A large scale study showed that the more Agreeable a user is, the greater their likelihood of being tagged in Facebook photos, suggesting that such likable people are invited to take photos with others more often, thus being tagged via more contacts on Facebook (Bachrach et al. (2012). Although this study did not examine whether highly Agreeable profile owners also tag contents of their friends, it seems Facebook users tend to tag their more Agreeable friends as a reciprocal offline to online interaction. According to the theory of reciprocity, in response to kind and nice actions individuals behave nicer and friendlier in return (Falk & Fischbacher, 2006). Therefore we made the following hypothesis (H3): because of their desire for being warm and showing appraisal towards friends in the offline communications and based on the Theory of Reciprocity, highly Agreeable users will attract more online attention by receiving more Facebook 'likes' and 'comments' on their profile pictures and will be tagged in more photos in general.

### 1.3.4. Conscientiousness and Facebook

Highly Conscientious people are hard-working, disciplined and thorough. They also demonstrate good performance at work (John & Srivastava, 1999; McCrae & Costa, 1997). They are socially lonely and do not spend much time on online communication platforms such as Facebook actively (Ryan & Xenos, 2011). Ross et al. (2009) indicated that highly Conscientious users are less likely to engage on Facebook as they consider such environments as procrastination and distraction tools. Nevertheless, some might argue that Conscientious individuals use Facebook purposefully to attain their personal goals such as online marketing or other professional aims. On the other hand, Unconscientious individuals are likely to use SNSs intensively and are prone to addictive usage (Wilson et al., 2010). Conversely, Bachrach et al. (2012) found Conscientiousness as the only trait that positively correlates with extensive Facebook photo uploading. Seidman (2013) showed highly Conscientious users are very cautious about their self-presentation, and are less inclined to engage in Facebook activities, whereas being low on Conscientiousness is the best predictor of self-presentation related behaviours and motivations in which they tend to expand their online connections. Accordingly, this study suggests that in order to find a better understanding of the link between this trait and Facebook behaviours further research needs to focus on the type of activities rather than usage per se.

As highly Conscientious individuals are self-disciplined and goal-orientated, they may display a tendency to document and organize their online photos and videos via Facebook visual tools. Although there is not much literature on the effect of Conscientiousness on Facebook photo-related behaviours, we offer this hypothesis (H4): there will be a positive relationship between Facebook users' level of Conscientiousness and the number of self-generated photo albums in their profile.

### 1.3.5. Openness to experience and Facebook

Openness to new Experiences (Intellect) is associated with being curious and having a propensity to pursue creative and

new experiences. Also, highly Open people are known to be artistic and imaginative and have an appreciation for the arts (John & Srivastava, 1999; McCrae & Costa, 1997). Research indicates that highly Open users post more 'wall' messages for their Facebook friends. Additionally, they are willing to use a greater number of different features, which makes their personal information section significantly more complete than low Open users (Amichai-Hamburger & Vinitzky, 2010; Ross et al., 2009). On the contrary, Seidman (2013) examined expressive behaviours of Facebook users and found no association with this trait. Furthermore, Gosling, Augustine, Vazire, Holtzman, and Gaddis (2011) showed that highly Open Facebook users frequently added and replaced their photos due to their tendency for engaging in a wide range of activities. Literature on the behavioural manifestations of Openness is contradictory, which may be a reflection of the complex nature of this trait (Mehl, Gosling, & Pennebaker, 2006). Nevertheless, by employing automatic data analysis on themes of thousands of Facebook 'likes', accuracy level of prediction for Openness has been shown as close to the test–retest accuracy of a standard personality test (Kosinski, Stillwell, & Graepel, 2013). There is little basis regarding the effect of the Openness on Facebook visual activities; however, due to having broad interests and a tendency to try out new experiences we propose this hypothesis (H5): as creating and posting personal videos can be considered a relatively new form of visual communications and telling life stories online, we expect a positive relationship between Facebook users' level of Openness and the number of video uploads in their profiles.

## 2. Method

### 2.1. Participants

To be eligible to take part in the study participants had to be over the age of 18 and be active Facebook users. They were asked to define themselves as an inactive user if there had been no recent profile activity or if they had not viewed the newsfeed or their friends' activity within the past three months prior to their participation. Participants were also required to add the researcher to their friends list. They consented to their Facebook photos being coded by completing an online consent form and submitting the completed questionnaire pack.

One hundred and fifteen participants completed an online personality and demographic questionnaire pack and added the first researcher as a Facebook friend. However in total 130 participants took part in the study, and 15 were excluded from the final sample. Three profiles were created less than three months prior to the study and another three profiles had privacy settings that restricted viewing most of the content. Two respondents provided the wrong profile URL (a broken link). Four participants did not add the researcher to their profiles and three others were excluded because they opted out by 'unfriending' the researcher before data analysis commenced.

Approximately 60% of participants were undergraduate psychology students who signed up for the study via the University of Wolverhampton's Psychology pool, receiving one credit for participation, and 35% were undergraduate or postgraduate students from other disciplines who were invited in person on the main city campus. The remaining 5% were friends of participants, and were recruited via snowball sampling. None of the participants were from the researcher's own friends list. Approximately 75% of the participants were female (84 Female, 31 Male). Age ranged from 17 to 55 years. The age of four participants were unreported either in the survey or on their Facebook profile (Age overall  $M = 22.21$  years,  $SD = .580$  years). For males, the mean age was 23.15 years ( $SD = 5.19$  years) and for females the mean age was 21.87 years ( $SD = 6.52$  years).

### 2.2. Materials

The study employed a content analysis approach. A photo codebook was devised by the researchers using a mixture of emergent and a priori coding, whereby some of the categories were established after a review of the literature and others were established after a preliminary examination of the data. Every single category and subcategory had a clear definition to limit the level of subjective interpretation and to make the coding procedure reliable and replicable. These categories measured the quantity and type of Facebook photos (see Appendix A). A Facebook 'research profile' was set up for the sole purpose of this study. It only contained the study announcement and a link to the online questionnaire. The profile privacy settings were set to 'public', which meant that it was easily searchable and accessible for everyone who intended to participate, but the friends list and all other privacy options were set up to be visible to the researcher only. To measure personality, the 50-item set of IPIP (International Personality Item Pool) Big-Five factor was used (Goldberg et al., 2006). IPIP internal consistency is good to excellent measured with Cronbach's coefficient alpha for all five factors (Extraversion = .87, Agreeableness = .82, Conscientiousness = .79, Emotional Stability = .86, Intellect or Imagination = .84). Each of the five domains comprises 10 items ranging from 1 (Almost Never/Never) to 5 (Almost Always/Always). Some items in each domain scale are negatively keyed.

### 2.3. Procedure

This study used a within subjects design. It employed a questionnaire and a codebook. Every participant answered demographic and self-rating personality questions and added the researcher's profile to their friends list. Participants' Facebook profile photo/album quantities were the units of analysis. Respondents were recruited via one of three methods. First, by uploading a URL to an online survey designed in [www.surveymonkey.com](http://www.surveymonkey.com) in the University of Wolverhampton psychology students' participant pool. Second, by advertising the URL on some Facebook pages related to the postgraduate, student union and alumni page with permission from the administrators. Third, by inviting participants in person on the main city campus. By finishing data collection, the profiles of those participants who gave their Facebook identity and consent were quantified. The codebook was applied to each Facebook profile individually by following the URL that participants provided in the online questionnaire. The first author did the coding and a second peer researcher coded a sub-sample of 15% of the sample to establish inter-coder reliability. Agreement levels for all variables were 100%.

## 3. Results

To identify which elements of the Big Five factors could be good predictors of the level of photo participation and photo-related activities, a series of multiple regression analyses were conducted with each of the Big Five traits entered as the predictors (Model 1). Studying the correlation matrix of variables showed Facebook experience (i.e. duration of Facebook use) was highly correlated with nine out of the ten dependent variables (except the number of cover photos; a relatively new feature). Facebook experience broadly approximated a normal distribution ( $M = 4.0$ ,  $SD = 1.4$  in years). Accordingly, Facebook experience was considered as another meaningful independent variable and was added to the analysis (Model 1) to see its interaction with personality traits (Model 2).

Due to the skewness of the dependent variables, square root and log10 transformations were applied. For the ease of interpret-



ability, Table 1 shows raw units for means and standard deviations. Furthermore, the main assumptions of multiple regression such as linearity were checked. Thus after transformation, P–P and scatter plots were screened (Field, 2012, p. 220). Moreover, multicollinearity was not an issue and finally the assumption that error in regression are independent was checked (i.e. Durbin-Watson Statistic) as they were close to 2 or between 1 and 3 and this was not an issue as well (Field, 2012, p. 220). Regression analysis using the backward method was chosen to test each individual contribution. Thus, the factors with the most explanatory power appeared last by elimination of weaker predictors, avoiding suppressor effects of independent variables on each other (Field, 2012, p. 213). In both models the ten codebook items were treated as dependent variables (see Table 2).

Results indicate that the amount of variance predicted by the independent variables increased in 5 of the 10 dependent variables when Facebook experience was entered into the model. Facebook experience did not contribute to only 3 models of total number of cover and average number of 'likes' and 'comments' per profile pictures; however, in the two models of total number of tagged photos and profile pictures, this factor emerged as the only significant predictor while personality factors did not contribute. The comparison of coefficient of determination  $R^2$  and  $R^2_{adj}$  between model 1 and model 2 were reported as an access for the goodness of fit (see Table 2).

Detailed results from the interaction of the six predictors (Model 2) are presented as follows; H1 and H2 were supported by the data. As a group, Extraversion ( $\beta = .221$ ,  $p = .027$ ), Neuroticism ( $\beta = .236$ ,  $p = .018$ ) and Facebook experience ( $\beta = .319$ ,  $p = .001$ ) significantly predicted participants' total number of uploaded photos, ( $F(3,93) = 6.905$ ,  $p = .001$ ), accounting for 15.6% of the total variance. Extraversion ( $\beta = .238$ ,  $p = .019$ ), solely explained 4.6% of the variance and significantly predicted the number of cover photos, ( $F(1,95) = 5.680$ ,  $p = .019$ ). In terms of average number of photos per albums ( $F(3,93) = 4.103$ ,  $p = .009$ ), Neuroticism ( $\beta = .246$ ,  $p = .018$ ) and Facebook experience ( $\beta = .207$ ,  $p = .036$ ) loaded onto the model that accounted for 8.8% of the total variance, however, Extraversion which was correlated with the higher number of photos did not contribute in this model significantly. Higher scorers of Extraversion had more Facebook friends. Extraversion ( $\beta = .265$ ,  $p = .006$ ) together with Facebook experience ( $\beta = .301$ ,  $p = .002$ ) explained 14.5% of the variance, ( $F(2,93) = 9.068$ ,  $p = .001$ ).

In line with our prediction in H3, Agreeableness ( $\beta = .207$ ,  $p = .049$ ) was found to be the only significant predictor of average number of received 'likes' on profile pictures. The model ( $F(2,86) = 3.556$ ,  $p = .033$ ) predicted 5.5% of the variance. Also, Agreeableness ( $\beta = .264$ ,  $p = .014$ ) influenced the model of predicting average number of received 'comments' per profile pictures and the model accounted for 6.4% of the variance ( $F(2,86) = 4.028$ ,  $p = .021$ ).

In line with expectation in H4, Conscientiousness ( $\beta = .208$ ,  $p = .028$ ) and Facebook experience ( $\beta = .377$ ,  $p = .001$ ) were predictors of number of self-generated albums. This trait and Facebook experience accounted for 16.8% of the total variance ( $F(2,94) = 10.653$ ,  $p = .001$ ). Finally, the association between Openness and the number of video uploads (H5) was not supported

by the findings. Conscientiousness ( $\beta = .301$ ,  $p = .002$ ) in addition to Facebook experience ( $\beta = .306$ ,  $p = .001$ ) explained 16.7% of the total variance and significantly predicted the number of uploaded videos ( $F(3,93) = 7.404$ ,  $p = .001$ ).

Facebook experience, alone ( $\beta = .347$ ,  $p = .001$ ) was revealed to be the strongest predictor of the number of tagged photos, which explained 11.1% of the total variance, ( $F(1,95) = 13.013$ ,  $p = .001$ ). Again Facebook experience ( $\beta = .319$ ,  $p = .001$ ) influenced the significant model of predicting higher number of profile pictures. This explained 10.6% of the total variance, ( $F(2,94) = 6.691$ ,  $p = .002$ ). Refer to Table 3 for a summary of ten prediction models. Non-significant independent variables were excluded (see Table 3).

Since our sample was predominately female, it was not promising to examine gender differences. This approach was also adopted by previous researchers (e.g. Ross et al., 2009). Furthermore, similar to Moore and McElroy (2012), after including gender, only a few of the previously proved significant models remained significant, suggesting that gender has little interaction with personality factors. Consequently, this study excluded gender from the prediction models.

#### 4. Discussion

The present results fit well within the main concept of the uses and gratification model as an 'audience-centred' approach in which individuals are goal-oriented and purposeful in demonstrating certain communication behaviours. SNSs, like Facebook, are 'ego-centred' networks in which profile owners are able to construct their profiles and manage their interactions in a way more adapted to their personal desires as well as in line with online communication norms (Mendelson & Papacharissi, 2010). Also, according to the extended real-life hypothesis, Facebook serves as a real life platform where users communicate their real personality (Back et al., 2010). Nonetheless, in terms of normative behaviours, self-disclosure research suggests CMC has generative effects rather than being merely a reflection of offline social norms. Particularly, disclosure of personal information via uploading pictures and videos is strongly associated with norms of online identity disclosure (Mesch & Beker, 2010). Results show that all of the ten tested features were significantly predicted by at least one of the five personality dimensions or by Facebook experience.

##### 4.1. The visual markers of personality

Results indicate that Extraverts upload more pictures in total and select more photos as their profile cover. The cover photo is the largest picture located at the top of the profile page. This photo is always public on the Internet and Facebook does not allow any manipulation of its privacy settings. Particularly, Facebook encourages users to select a unique cover photo to make real profiles distinguishable from fake ones (Facebook help, 2013). Arguably, users set a unique photo that shows their life preferences and concerns. Extraversion has been confirmed as the best predictor of communication-related behaviours and motivations on Facebook. Also Extraverts are more inclined to express their actual selves (Seidman, 2013), suggesting that they are generally happier with

**Table 1**

Raw mean and standard deviation are shown for the ease of interpretability of the ten dependent variables.

	No. Facebook friends	No. tagged photo	Total uploaded photos	No. uploaded album	Ave. photo per album	No. cover	No. uploaded video	No. PP <sup>a</sup>	Ave. like per PP <sup>a</sup>	Ave. comment per PP <sup>a</sup>
Mean	428.0	240.7	636.6	16.0	29.7	4.3	2.5	42.2	4.65	1.5
SD	358.9	361.4	969.7	19.9	27.0	5.4	5.6	63.9	5.2	2.2

<sup>a</sup> PP: Profile picture.

**Table 2**Comparison of  $R^2$  and  $R^2_{adj}$  to show the goodness of fit between prediction model 1 and model 2 for the ten dependent variables.

	No. Facebook friends		Total No. uploaded photo		No. uploaded albums		Ave No. photo per album		No. uploaded videos	
	$R^2$	$R^2_{adj}$	$R^2$	$R^2_{adj}$	$R^2$	$R^2_{adj}$	$R^2$	$R^2_{adj}$	$R^2$	$R^2_{adj}$
Model 1	.097	.078	.071	.052	.050	.040	.067	.048	.081	.072
Model 2	.163	.145	.182	.156	.185	.168	.117	.088	.193	.167
	No. profile pictures		No. tagged photos		No. cover		Ave No. like per profile picture		Ave No. comment per profile picture	
	$R^2$	$R^2_{adj}$	$R^2$	$R^2_{adj}$	$R^2$	$R^2_{adj}$	$R^2$	$R^2_{adj}$	$R^2$	$R^2_{adj}$
Model 1	.000	.000	.000	.000	.062	.052	.048	.038	.126	.096
Model 2	.125	.106	.120	.111	.056	.046	.076	.055	.086	.064

who they are. Extraverts are emotionally expressive and behave in an overt way, for example they tend to wear more fashionable clothing (Riggio & Riggio, 2002). The more Facebook users upload photos, the more they may disclose their true selves depicted in photos. Even though not all photos contain the profile owner, photos can evidence attitudes and underlying desires by telling life stories. Furthermore, Extraverts can express their exhibitionistic nature via SNSs.

Consistent with the literature, results show that highly Extravert individuals establish greater ties of online friendship on Facebook (e.g. Quercia et al., 2012). Such findings justify the social enhancement or 'rich get richer' hypothesis that states individuals who already have many established contacts will be able to increase networks via their interactions on the Internet (Zywicki & Danowski, 2008). Evidently, Extraverts' need for high stimulation and being in unlimited contact with many friends seem to be well gratified on Facebook. Having more friends, uploading more pictures in total and selecting more cover photos in particular seem to be a true manifestation of this personality characteristics. Thus, it appears highly Extravert Facebook users gratify their self-presentation and communication needs through intensive projection of Facebook imagery.

In addition to Extraversion, Neuroticism was predictive of uploading significantly more photos on Facebook. This is consistent with one of the pioneer studies that stressed extensive online self-disclosure among high scorers of Neuroticism (Amichai-Hamburger, 2002). Our findings suggest that highly Neurotic users seek acceptance implicitly through publishing Facebook photos. This is partially in line with findings that showed Facebook users high on Neuroticism are more likely to post photos of themselves (Amichai-Hamburger & Vinitzky, 2010). Neuroticism is the best predictor of both central needs of belongingness and self-presentation for Facebook use. As highly Neurotic people are not communicational and socially skilled, they are particularly motivated to express different facets of the self on Facebook to meet the need of self-presentation online (Seidman, 2013).

Alternatively, as heavier Internet and Facebook users (Amichai-Hamburger, 2002; Moore & McElroy, 2012), they presumably try to adapt to the normative patterns of Facebook behaviours to seek acceptance and to decrease feelings of loneliness (Hughes, Rowe, Batey, & Lee, 2012; Ryan & Xenos, 2011). Based on the social learning theory, observation of others' behaviour in a social context may influence the person to behave in similar ways (Bandura, 1977). Previous research showed that Facebook users that saw more of their friends' photo uploads were motivated to upload more photos themselves. Furthermore, particularly regarding photo participation, SNSs have all the conditions for social learning to occur (Burke, Marlow, & Lento, 2009). Pursuing this strategy, highly Neurotic users possibly manage their online impressions more effectively by keeping in line with the Facebook popular culture that is visual communication via photo uploads and generating more visual content.

Further findings showed that on average highly Neurotic users also have more photos per album. On the one hand, Neuroticism and Extraversion significantly predicted more photo uploads. On the other hand, Conscientiousness was predictive of more self-generated albums. Nevertheless, Neuroticism alone predicted having more photos per album. Thus, highly Neurotic users appear to have a greater number of voluminous photo albums than highly Extravert and highly Conscientious users. Once more, this may be indicative of their attempt to look more attractive online (Wehrli, 2008). Also by intensive photo participation, they may try to provide visual evidence to look happier and more popular on Facebook to 'keep up with the Joneses'. Collectively, Facebook users higher on Extraversion and/or Neuroticism who had a Facebook account for longer uploaded significantly more photos to their profiles.

Interestingly, current findings indicate that highly Agreeable users receive more 'likes' and 'comments' on their profile pictures. Facebook relationships tend to reflect offline networks, in which interactions take place primarily with people already known to the networker, known as 'anchored relationships' (Zhao et al., 2008). Given reciprocity theory (Falk & Fischbacher, 2006) one possible explanation is that Facebook users will respond to the perceived kindness of their highly Agreeable friends by providing more 'likes' and 'comments' on their photos. According to the reciprocity theory, in response to kind and nice actions individuals behave nicer and friendlier in return. Reciprocity is a rewarding action, that is known as a strong determinant of human behaviour (Falk & Fischbacher, 2006).

We excluded 'likes' and 'comments' from profile owners and only friends' contributions were coded. Although we did not measure whether highly Agreeable users also 'liked' and 'commented' on their friends' profile content, it seems 'liking' and 'commenting' can be considered as a positive reciprocal behaviour and takes roots in anchored offline relationships that Facebook users maintain online.

In particular, 'Like' is a very popular communication feature on Facebook by which different messages may be conveyed. Therefore, its implications extend beyond the literal meaning of 'like' as someone merely liking a photo or a status update (Mendelson & Papacharissi, 2010). Arguably, users may 'like' a friend's post to say it is good to hear from them or to signal they had seen the post. The feature of 'like' may play a pivotal role in strengthening offline friendships by which friends keep in touch online. In Facebook popular culture, 'liking' and 'commenting' imply attention and care to friends' life events announced via profile updates. In a similar vein, users 'like' product brands or fan pages and participate by leaving 'comments' to express their support and admiration.

Although, this study showed no association between Agreeableness and the number of tagged photos, the three communication features of 'like', 'comment' and 'tag' have several functions in common by which users not only demonstrate and even show off relationships and stress group identities, but also by virtually connecting up content of profiles, they strengthen and expand

**Table 3**

A summary list of findings to show personality traits and Facebook experience as predictors of Facebook visual presence.

Predictors	Predicted Facebook features
Extraversion	No. of Facebook Friends Total no. of uploaded photos Total no. of cover photos
Neuroticism	Total no. of uploaded photos Ave. no. of photos per albums
Agreeableness	Ave. no. of 'Likes' per profile picture Ave. no. of 'Comments' per profile picture
Conscientiousness	Total no. of self-generated albums Total no. of uploaded videos
Openness	–
Facebook experience	No. of Facebook Friends Total no. of uploaded photos Total no. of self-generated albums Total no. of uploaded Videos Total no. of tagged photos Total no. of profile pictures Ave. no. of photos per albums

friendships online. Consequently, it may be safe to posit that Facebook users try to foster online relationships with a more Agreeable Facebook friend in response to their offline warm and friendly behaviours.

In terms of Conscientiousness, results revealed that high scorers prefer to create new albums and organize their photos properly in various folders rather than leaving them in Facebook default albums or accumulating new photos in existing folders. Considering the uses and gratification model, these findings underline the personality dispositions of such individuals who are organized and less spontaneous. Furthermore, highly Conscientious users uploaded more video clips to their profile. It is partially consistent with the findings on associations between high on Conscientiousness and extensive Facebook photo uploads (Bachrach et al., 2012). Nevertheless, from our data it cannot be inferred that highly Conscientious users possess a greater number of Facebook photos or videos, but noticeably, they have a preference to document their personal files using Facebook tools.

Facebook visual features are rapidly improving (Ryan & Xenos, 2011) to fulfil its growing users' expectations, particularly with the prevalence of smartphones and mobile applications. Employing such visual tools, users can effectively communicate and receive comments on every single photo or video. In this context, as goal-oriented individuals, highly Conscientious users not only document their life stories but also share them with their friends and family in a more convenient way than using email for instance.

Finally, we found no significant effect of Openness on Facebook photo-related activities. Due to having broad interests and a tendency to try out new experiences, it seems highly Open profile owners use a variety of online features (Amichai-Hamburger & Vinitzky, 2010; Ross et al., 2009) but they do not engage in intensive use of one or two communication methods. Additionally, Facebook has very quickly become popular and turned into a common communication tool for university students. So, using Facebook features is not considered unique anymore (Smock et al., 2011) and it may not encourage particularly highly Open users to engage with the site. They no longer consider Facebook as a new experience or method of online communication (Seidman, 2013).

#### 4.2. Facebook experience and users' visibility

In terms of users' visibility and irrespective of personality factors, the longer users had been members of Facebook, the more

visual contributions they made. Our findings showed the older profiles contained more total photos, videos, albums, tagged photos, profile pictures and photo per albums. In terms of online interactions, again and irrespective of personality factors, it seems users gradually expand their Facebook networks by adding new friends and consequently through online communications they generate more mutual content. For example, users will be tagged in more photos. In the present study, Facebook experience emerged as the sole predictor of having more tagged photos and more profile pictures.

Applying the uses and gratification framework, motivational studies have found maintaining friendships as one of the main motives for Facebook use (e.g. Smock et al., 2011; Tosun, 2012). Since, 'tagging' is a very common strategy in which profiles link together, it could be that the profile owners use the tag feature to create and maintain bridging and bonding with friends in SNSs and demonstrate their relationships with other people within and outside of their networks. Based on Facebook default settings, friends and the friends of friends of tagged people will gain access to the photo. Although users can control whether tagged photos appear on their profile or not, shown tagged photos always remain visible to ones' friends unless they have been untagged or deleted.

In terms of the quantity of profile pictures, present data showed personality differences do not play a role, whereas Facebook experience was the sole predictive factor. It seems that the level of profile owners' visibility increases over time. Given the uses and gratification theory, more experienced users develop greater affinity with Facebook and depend more on the interactions via this social platform (Papacharissi & Mendelson, 2011). Additionally, findings are partially in line with Moore and McElroy (2012) who pointed out Facebook experience was significantly related to several Facebook features such as total number of friends and uploaded photos. Particularly, regarding total photo uploads and frequency of Facebook use personality did not significantly contribute, whilst Facebook experience was the determinant factor. It seems plausible to conclude that the increased level of visual disclosure is the consequence of using Facebook for longer.

#### 5. Conclusion and limitations

This study is one of the first to discover visual markers of personality from Facebook photos and photo-related activities. The findings revealed that profile owners with various personality types set up albums and upload photos differently. Users differ in their tendencies towards generating certain visual features on Facebook, for example cover photos or video clips. The results add to the growing body of literature around the influential role of personality characteristics to identify how various psychological needs can be gratified through the intensity of engagement with specific communication feature on Facebook. It also extends the current knowledge of other influential factors such as length of Facebook membership.

Although we found the substantial effect of Facebook experience on the amount of self-generated visual content as well as the amount of built-up content from users' interactions, we acknowledge that over 85% of our sample was undergraduate and university students. Thus, these users are perhaps at an age in which identity construction is particularly relevant to them (Pempek et al., 2009; Ridout, Campbell, & Ellis, 2012). Therefore, one might expect that they would extensively engage in self-presentation and self-disclosure in SNSs whereas, by finishing official education they have probably formed their social identity and networks of friends, thus may be less motivated to claim an online social identity. In addition, having new commitments to work



and family they seem to find less free time to spend online. It is possible to generalize these findings; nevertheless, to examine the effect of Facebook experience in interaction with the age of users, further research is needed to identify the visual participation level from different age groups with the same profile age or Facebook experience.

We used actual profile data retrieved manually, though the majority of the literature relies on self-report data. Despite these strengths, findings were restricted to a predominantly female sample of college-age students. Furthermore, research should include examining the content of photos and videos to explore new visual markers and to gain a deeper understanding from certain underlying dispositions that could be depicted in Facebook photos. For example, concerning Neuroticism this study showed surprising results. Moreover, regarding personality cues of Openness no significant correlations emerged. As we only examined the quantity of photos further studies may explore whether highly Open and/or Neurotic users favour certain themes (e.g. self-photos or 'selfies', photos of others or objects only). Moreover, conducting qualitative studies and using methods such as interviews could better explain unclear motives on Facebook photo-related behaviours.

Although this study detected personality and Facebook experience as significant predictors of both the level of visual presence and visual interaction on Facebook, undoubtedly other influential factors could account for the remaining amount of variance that were not explained. Thus, measuring individual differences in psychological factors such as self-concepts, appearance contingencies of self-worth, and self-objectification or physical factors such as body shape and attractiveness should be explored in future. This study only examined uploaded self-selected photos as a measure of users' content contribution and the level of visual presence. However, sharing photos of others (e.g. from Facebook groups and public pages) may be considered a different behaviour that was outside of the scope of this research. Finally, results indicate that by merely measuring levels of users' visual contribution, relatively accurate predictions of the profile owners' Big Five personality traits are possible.

## Appendix A. Photo codebook

- V1: Total No. of Facebook tagged photos. (The figure is displayed on the profile page under the section 'photo of' followed by the name of the profile owner.)
- V2: Total No. of uploaded photos. (The coder should add up No. of photos from each album excluding profile picture and cover album.)
- V3: Total No. of self-generated albums. (Count the total No. of albums in the user profile excluding profile picture album, cover album and video album.)
- V4: Average No. of photos per album. (Total No. of counted photos in variable 2, divided by total No. of counted albums in variable 3.)
- V5: Total No. of videos. (Count the video clips in video album, tagged videos uploaded by friends of user should not be counted.)
- V6: Total No. of profile photos (i.e. the coder should count the No. of photos in the system-generated album of 'profile pictures').
- V7: Total No. of cover photos (i.e. the coder should count the No. of photos in the system-generated album of 'cover photos').
- V8: Average No. of 'like' per profile picture (i.e. the first 3–5 photos from the profile pictures album will be coded. The coder should count the total No. of 'likes' excluding profile owner's likes).
- V9: Average No. of comments per profile picture (i.e. the first 3–5 photos from the profile pictures album will be coded. The coder should count the total No. of picture comments excluding profile owner's comments).
- V10: Total No. of Facebook friends shown on profile homepage.

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