

TO USE OR NOT TO USE: THE RELATIONSHIP BETWEEN PERSONALITY TRAITS AND INSTAGRAM USAGE

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Abstract. Despite its social and economic relevance, Instagram and its users have rarely been in the focus of research so far. Specifically, who uses the platform how is not well understood so far. This study aims to close this research gap by investigating the relationship between personality traits and Instagram usage by conducting an online survey. Our results show that there is a positive relationship between extraversion and the number of followers and followings a user has. Furthermore, there is a negative relationship between conscientiousness and visit duration on the platform. Users with private profiles are higher in agreeableness compared to users with public profiles. Moreover, early users of Instagram are higher in extraversion and lower in neuroticism compared to users who joined the platform recently.

Keywords: Instagram, Social networking site, Big Five, OCEAN, Personality traits.

1 Introduction

Today, Instagram constitutes one of the most popular social networking sites (SNS) counting around one billion active users [39]. The platform allows its users to share visual content on their individual profiles and to connect with others via the ‘following’ activity. As the platform is mainly used via mobile devices, user profile pages and their respective content has the potential to provide fine-grained personal insights in the everyday life of its users [20] as smartphones can be considered to be ones’ everyday companion. With around 6.84 billion U.S. dollars of revenue in 2018, the revenue generated by Instagram is predicted to reach 14 billion U.S. dollars in 2019 [40]. However, despite its social and economic relevance, Instagram has rarely been

considered in research so far. In particular, limited knowledge exists about who is using the platform, specifically what kinds of personality traits Instagram users have [38].

Personality can be considered to be a highly relevant factor in determining human behavior on SNS (e.g. [2], [37]) and it has been shown that personality traits influence several factors such as online political engagement [35], early adoption of technologies [10] or addictive tendencies [45]. Furthermore, knowledge about user personalities can also provide valuable information for the platform provider to build a more personalized user experience [18] and thereby increase user satisfaction to increase loyalty towards the platform. Systems using personality-based personalization can have a strong advantage over systems not doing so. The usefulness of personality traits for personalization is specifically due to its domain independency meaning that such information can be used across several domains. Therefore, the relationships between user personality traits and behavior are increasingly investigated in the area of health, education or marketing [19].

As personality traits have been shown to be an important predictor for individuals' behavior and due to the increased relevance of Instagram as a platform, our study aims to provide insights into the relationships between personality traits of Instagram users and how individuals with specific traits use the platform. Specifically, our research questions are as follows: We aim to investigate (1) the personality traits of Instagram users to investigate there are potential differences in personality traits of users in comparison to non-users. Furthermore, by linking personality traits with specific usage patterns of Instagram users (e.g., number of followers, time spent on the platform) we aim to derive whether (2) differences in personality traits with regard to usage patterns are prevalent on the platform. While prior work on Instagram so far only focused on pictures (e.g. [19], [26]), we focus on specific usage patterns which were not investigated on Instagram yet.

We measure the personality traits of users based on the Big Five model using the NEO-FFI test. The Big Five is a psychological model to describe the personality of an individual using five independent factors: openness to experience, conscientiousness, extraversion, agreeableness, and neuroticism [25], [31] (OCEAN). The model has frequently been used to characterize the personality traits of individuals of different SNSs (e.g. [1]).

We are able to show a positive relationship between extraversion and the number of followers and followings. Furthermore, we find a negative relationship between conscientiousness and visit duration. Results also show that early adopters of Instagram are higher in extraversion and lower in neuroticism compared to users who joined the platform recently. In addition, we are able to show that users with private profiles are higher in agreeableness in contrast to users with public profiles.

The remainder of the paper is structured as follows: First, we present related research on the topic of personality traits of SNS users. By this, we show the existent research gap and postulate our hypotheses. We then continue to describe our methodological approach, which is based on a survey. The fourth chapter will present our results which we will discuss in the following chapter. Last, we will derive a conclusion and state directions for future research.

2 Related Work and Hypotheses

Table 1 shows a summary of studies which investigate users' personality traits on different SNSs. The table shows the investigated pattern of SNS usage behavior in the focus and which dimensions of the OCEAN model can be associated with those patterns. As different SNS have different affordances, they attract different types of users [41]. Research provides evidence that users of various SNS differ in their personality [34], therefore making it necessary to investigate the personality traits of the users of each individual SNS.

Table 1. Selection of relevant studies for the current paper:
Instagram (IG), Facebook (FB), not specified (NS), various (VS)

| <i>Ref.</i> | <i>SNS</i> | <i>Pattern</i> | <i>O</i> | <i>C</i> | <i>E</i> | <i>A</i> | <i>N</i> |
|-------------|------------|--------------------------------|----------|----------|----------|----------|----------|
| [27] | IG | Color of photos | X | | X | X | X |
| [28] | IG | IG addiction | | X | | X | |
| [20] | IG | Content of pictures | X | X | X | X | X |
| [19] | FB | Intensity of FB usage | | X | X | X | X |
| [26] | NS | Photo messaging usage | | | X | | X |
| [11] | FB | Facebook usage | X | X | X | | X |
| [38] | FB | Online political engagement | X | | X | | |
| [46] | VS | SNS usage | X | | X | X | X |
| [48] | VS | SNS usage addictive tendencies | | X | X | | |
| [39] | FB | FB usage | X | | X | | |

So far, available studies mostly investigate the relationship between OCEAN and the usage of other SNS such as Facebook and Twitter. In case of Instagram, so far no research is available that provides insights on how users differ from non-users in their personality. However, it has been investigated how OCEAN traits might affect the usage of Instagram with respect to which kind of pictures are uploaded on the platform. [18] report a relationship between several characteristics of pictures (e.g., relevant to hue, brightness, saturation) and personality traits. Furthermore, the authors show that predictions of personality traits based on characteristics of profile features are possible. In addition, [26] show that agreeableness is associated with preferring specific colors on Instagram. Moreover, they show that neuroticism is negatively associated with color harmony and that extraversion is positively correlated with color diversity while openness is negatively correlated with color diversity and color harmony of photos.

It has been shown, that Facebook users and non-users differ in their personality traits [37]. Facebook users have been shown to have significantly higher values in extraversion and lower values in conscientiousness compared to non-users. Since Facebook and Instagram differ significantly in their affordances and their main usage motivation it is necessary to investigate to what extent Instagram users show similar or different personality patterns in comparison to non-users. The most distinctive feature of Instagram is the mainly visual-based content whereas Facebook allows the upload of a variety of content (e.g., text, links, pictures). Further, Facebook only allows

bidirectional connections between profiles, i.e., a user has to agree that they are friends with the person requesting a connection. In case of Instagram, unidirectional connections are possible meaning that an individual user can follow an account but not the other way around. This creates a potential different motivation why to use the platform. While Facebook is mostly used to connect and communicate with friends, studies reveal that 66% of users prefer Instagram in order to interact with influencers and brands [47]. Based on these significant differences with respect to affordances available on Instagram, our first aim is to investigate whether Instagram users differ from non-users in their personality. Therefore, to answer our first research question we postulate the following hypothesis:

H1: Instagram users differ significantly from non-users in their personality traits.

Furthermore, in relation to our second research question we strive to understand how personality traits affect how Instagram is used. Results based on Facebook [6] indicate that conscientious individuals might consider the usage of SNS to be a waste of time and a distraction from other activities such as work and thus tend to join fewer groups and like fewer objects. In contrast, they identify a positive relationship between conscientiousness and the number of uploaded pictures. [46] argue that conscientious individuals want to avoid distraction from productive activities. Additionally, other researchers point out that conscientious individuals prefer rather academic than leisure activities on the Internet [33]. In line with this, [32] and [45] indicate that individuals with higher values in conscientiousness spend less time on SNS. [23] suggested that conscientiousness is negatively related with the time that users spend on Facebook and Twitter, equally to [37], who also showed a negative relationship between the personality trait conscientiousness and the duration of daily Facebook usage. In contrast, [33] and [36] could not confirm this relationship. Due to the ambiguous results, we decided to investigate the relationship between conscientiousness and time spent on Instagram. We postulate the following hypotheses:

H2a: There is a negative relationship between conscientiousness and the duration of Instagram usage.

H2b: There is a negative relationship between conscientiousness and the frequency of Instagram usage.

Individuals with high values in extraversion have more social contacts in the form of Facebook friends [1], [3] and Facebook groups [36]. [29] show that extroverted users have more Facebook friends, upload more pictures, write more comments and tend to post and like more status updates. Investigations on other SNS also showed that extraversion has a positive relationship with self-presentation as well as with virtual interaction [9]. In contrast, [36] found no relationship between extraversion and the number of Facebook friends. The authors argue that extroverts might use Facebook as a social tool but they do not use it as an alternative to their social activities in their real life. Apart from this, [4] conclude that extroverts do not use the Internet as a substitute for their interactions in real life. Due to evidence in the literature, we formulate the hypotheses that extroverted Instagram users do interact more (with others) on Instagram:

H3a: There is a positive relationship between extraversion and the number of followers on Instagram.

H3b: There is a positive relationship between extraversion and the number of followings on Instagram.

H4: There is a positive relationship between extraversion and the average number of posts per day on Instagram.

Individuals high in agreeableness tend to accept new technologies faster [16]. They are more persistent and more tolerant of websites with low usability in terms of navigation [28]. Agreeable users tend to apply more impression management [15] and are more selective about their self-presenting pictures and texts [24]. Furthermore, [46] show that individuals with low agreeableness tend to personalize their smartphone with apps to achieve better self-presentation. In the case of Instagram comparable behavior could be captured by the profile settings “public” and “private”. This leads to the assumption that agreeable individuals prefer to keep their profile private in order that only personally selected users can see their posts. We therefore hypothesize:

H5: Users who set their profile on “private” have higher values in agreeableness than users who set their profile on “public”.

Research results indicate that individuals high in extraversion behave more sociably and outgoing in the online and in the offline context [30]. This leads to the assumption that early adopters of Instagram can be characterized by a higher extraversion in comparison to late adopters. In other words, a longer period of active membership is related to higher values in extraversion. In the present paper, the length of active membership is defined as the number of days since their first post.

H6a: There is a positive relationship between extraversion and the duration of active membership on Instagram.

Various studies reveal that individuals with high values in neuroticism tend to use SNS [2], [13]. In addition, [43] find that people who are classified as neurotic are more likely to use status updates as a way of self-expression. [42] prove that neurotic personalities are more interested in sharing content. [21] show that neurotic individuals also tend to blog on the Internet. In contrast, [24] reveal that neurotic users share fewer pictures compared to stable personalities. [46] explain that adopters of photo-sharing applications like Instagram and Snapchat are probably characterized by lower values in neuroticism because sharing and communicating with photos could trigger privacy concerns. According to the authors, these privacy concerns could prohibit neurotic people from adopting such apps. Based on this argumentation it was assumed that early adopters of Instagram are lower in neuroticism compared to late adopters. Thus, it was predicted that there is a negative relationship between neuroticism and the length of active membership (number of days since the first post).

H6b: There is a negative relationship between neuroticism and the duration of active membership on Instagram.

Generally, high values in openness go hand in hand with exploration and usage of innovative communication channels [30]. Various researchers found a positive relationship between openness and the usage of SNS ([13], [21], [35], [42], [43]). [6] showed that openness correlates positively with the number of likes, group associations

and status updates on Facebook. This is due to the fact, that individuals with high openness are generally interested in new ideas and objects and like to share them with their friends [22]. In addition, [10] identify openness as a predictor for early adaption of Facebook. On average, early members of Facebook have higher values in openness compared to individuals who registered later. The personality trait openness plays a major role in the adaption of new SNS. Individuals high in openness tend to use new communication channels [30]. [10] showed that openness is a predictor for an early adaption of Facebook. This leads to the assumption that early adopters of Instagram are higher in openness than users who joined the platform later.

H6c: There is a positive relationship between openness and the duration of active membership on Instagram.

3 Methodology

To test our hypotheses, we distributed an invitation to our study via Facebook, Instagram and the mailing list of a university. As an incentive to participate, we offered each participant a personal analysis of the results of their personality test. This had the additional advantage that it incentivized honest answers as participants might have been interested in getting to know themselves better having a result based on truthful answers. The survey contained no mandatory questions.

After providing their consent, we asked each participant a set of demographic questions. Furthermore, we included questions about general SNS usage asking participants which SNS they regularly visit, i.e., more than once per month. Participants were classified as Instagram users if they stated that they regularly visit the platform more than once per month. Those users were asked to answer three additional questions. The first question measured the duration of Instagram usage (“If you visit Instagram, approximately how much time do you spend there on average?”, adopted from [36] and [37]). The second question measured the frequency of Instagram usage (“On average, how often do you visit Instagram?”, adopted from [17]). The third question asked the participants for their Instagram user name in order to be able to identify and access the user profiles. We asked participants to provide their consent asking for permission to analyze their uploaded content on their Instagram profile for research purposes which participants could deny.

The next part of the survey consisted of the NEO Five-Factor Inventory (NEO-FFI) test [14] which we use to measure personality traits. The NEO-FFI is a questionnaire method based on factor analysis ([7], p. 7). The aim is to comprehensively measure individual differences in the five personality traits: openness, conscientiousness, extraversion, agreeableness, neuroticism [27]. We chose to use the NEO-FFI as it can be answered rather quickly compared to other common personality tests [5]. Furthermore, the German NEO-FFI has been shown to be a valid and reliable measure for personality traits. The internal consistency of the scales was assessed on 11.724 individuals and scales ranged between $\alpha = .72$ und $\alpha = .87$ [7].

Out of a total of 60 items, twelve each relate to one of the five personal characteristics [7]. Participants indicated their agreement to each item based on a five-

point Likert scale ranging from "strongly disagree" to "strongly agree". As the questions were not mandatory and a few participants did not answer all items, we removed all instances from our dataset with more or equal to ten unanswered questions as recommended by [7].

4 Results

4.1 Sample

A total of 1,280 individuals participated in our survey over a study period of 24 days. After removing instances of participants who did not complete the survey, 402 individuals remained in the sample, whereas 163 were Instagram users and 239 non-users. The mean scores across all 60 items and each dimension of the NEO-FFI test were calculated to allow for a further statistical analysis. Scores for each dimension of personality traits range from zero (i.e., not pronounced) to four (i.e., strongly pronounced). A neutral response would, therefore, result in the value of two on all items on a scale.

Of all participants in our sample having an Instagram account, 107 provided their Instagram profile and provided permission to further process their data. For those instances in our dataset, we additionally collected information derived from their Instagram profile. Additional variables include the total number of posts available on the profile, the average number of posts per day (i.e., the activity level of the profile), the privacy state of the profile (i.e., private vs. public), the number of followings and followers as well as number of days since the first post (i.e., maturity level of the profile). Table 2 shows the demographics for our full sample and categorized according to Instagram users and non-users.

Table 2. Age, gender and SNS usage for our sample.

| | | <i>Full Sample</i> <i>(N = 402)</i> | <i>IG Users</i> <i>(N = 163)</i> | <i>Non-users</i> <i>(N = 239)</i> |
|--------|-------------|--|-------------------------------------|--------------------------------------|
| Age | 16 – 20 | 15.7% | 20.2 % | 12.6 % |
| | 21 – 24 | 26.4% | 32.5 % | 22.2 % |
| | 25 – 29 | 26.6% | 21.5 % | 30.1 % |
| | 30 – 49 | 28.4% | 24.5 % | 31.0 % |
| | > 49 | 2.4% | 1.2 % | 3.3 % |
| Gender | Female | 66.2% | 72.4 % | 61.9 % |
| | Male | 32.1% | 25.8 % | 36.4 % |
| | Transgender | 1.0% | 1.2 % | 0.8 % |
| | Unspecified | 0.7% | 0.6 % | 0.8 % |

Focusing on the group of Instagram users, the majority (53.4%) states that they use Instagram less than ten minutes per visit while 33.7% report that a visit usually lasts between ten and 29 minutes. Noticeably fewer users reported a higher visit time of 30 to 59 minutes (8.6%), one to two hours (2.5%) or more than two hours (1.8%). Around

43.6% of users visit Instagram once a day and around 22.1% at most once a week. 17.2% use the social network two to five times a day, while 9.8% state that they visit the platform six to nine times a day. Only 7.4% of users visit Instagram more than nine times a day. Besides, around 29.9% of users set their Instagram profile on "private". The Instagram users in our sample have on average 341.96 followers ($SD_{Followers}=691.22$) and 281.58 followings ($SD_{Followings}=287.72$). Furthermore, the average number of days since the first post is 1131.67 ($SD_{Maturity}=599.97$), and the average total number of posts is 208.91 ($SD_{NumberPosts}=344.65$). The average number of posts per day is 0.21 ($SD_{PostsPerDay}=0.25$).

With respect to personality traits, the participants in our full sample show low levels of neuroticism ($M_N=1.98$, $SD_N=0.70$) and a slightly higher level of extraversion ($M_E=2.17$, $SD_E=0.56$). The three remaining dimensions openness ($M_O=2.73$, $SD_O=0.55$), conscientiousness ($M_C=2.50$, $SD_C=0.62$) and agreeableness ($M_A=2.63$, $SD_A=0.48$) show rather high levels.

4.2 Validity and Reliability of the Measurement Model

Scale reliability and validity of the Neo-FFI were assessed with Cronbach's alpha and exploratory factor analysis. Cronbach's alpha ranged from 0.70 (agreeableness) to 0.86 (extraversion). Therefore, each dimensions was above the recommended cut-off point of 0.7 [14]. The exploratory factor analysis showed that most items loaded on one of five dimensions. With respect to the loadings of items, most items loaded on the expected dimensions. However, eight from 60 items did not load dominantly on the expected dimensions. Nevertheless, a sufficient convergent validity was assumed on the basis that the remaining 52 Items had clear load to the right dimension.

Our results are similar compared to the results of the sample of [7] which also showed rather low levels of neuroticism and higher levels of the other personality traits. Therefore, in terms of representativeness, it can be assumed that there are no strong distortions within the sample regarding personality structure.

4.3 Difference between User and Non-Users of Instagram

In order to test our hypothesis that Instagram users differ significantly from non-users in their personality traits (H1) we first test our data for normal distribution using Kolmogorov-Smirnov, histogram and skewness analysis for all individual variables. All variables are normally distributed except for the variables number of posts, followers, and followings.

The results of the t-test for independent samples show no significant differences in the means of personality traits (Table 3). Therefore, we have to reject our hypothesis and conclude that there are no significant differences in terms of personality traits among Instagram users and non-users.

Table 3. Mean and standard deviation of personality traits among Instagram users and non-users.

| <i>Personality Trait</i> | <i>Instagram users (N = 163)</i> | <i>Non-users (N = 239)</i> |
|--------------------------|----------------------------------|----------------------------|
| Openness | 2.69 (0.59) | 2.76 (0.52) |
| Conscientiousness | 2.49 (0.63) | 2.51 (0.62) |
| Extraversion | 2.20 (0.56) | 2.14 (0.56) |
| Agreeableness | 2.58 (0.53) | 2.67 (0.44) |
| Neuroticism | 2.02 (0.71) | 1.94 (0.69) |

4.4 Differences in Instagram Usage

In the next step, we aim to understand further how Instagram users differ from each other in terms of how they use the platform. We first examine if there exists a relationship between conscientiousness and usage duration (H2a) and between conscientiousness and usage frequency of Instagram usage (H2b). Usage duration is defined by the time a user spends on Instagram per visit and usage frequency is defined by how often a user visits Instagram. Using the Pearson's product-moment correlation coefficient (two-tailed), our results show a negative relationship between conscientiousness and Instagram usage duration ($r=-0.169$, $p=0.032^*$) but no significant relationship concerning the frequency of Instagram usage ($r=-0.056$, $p=0.483$). However, a correlation of -0.169 can be seen as a rather small effect [12].

All subsequent analysis is based on the dataset of participants who completed the NEO-FFI and gave their permission to analyze their Instagram profile ($n=107$). First, we examine if there is a positive correlation between extraversion and the number of followers (H3a) and extraversion and the number of followings (H3b). Due to not normally distributed variables, we use the non-parametric Spearman rank correlation coefficient. We see significant positive relationships with small effect sizes [12] between extraversion and the number followers ($r=0.22$, $p=0.02^*$), as well as between extraversion and the number of followings ($r=0.20$, $p=0.04^*$). Therefore, our hypotheses H3a and H3b are supported. Furthermore, we find no significant correlation between extraversion and the average number of posts per day ($r=0.019$, $p=0.868$) and reject hypothesis H4.

Second, we analyze if users who set their profile to "private" are higher in agreeableness compared to users who set their profile to "public" (H5). The Levene's test shows that variance homogeneity can be assumed for all variables. In the next step, both user groups were compared with each other regarding their means of agreeableness using a t-test for independent samples. We find a significant difference in the means ($df=103$, $t=-2.07$, $p=0.04^*$). The effect size using Cohen's d corresponds to 0.452 which is a medium-strength effect. Hypothesis H5 is supported and we conclude that participants in our sample who set their profile to "private" tend to be more agreeable.

Third, we analyze whether there is a positive correlation between extraversion and the duration of active membership (H6a) and a negative correlation between neuroticism and the duration of active membership (H6b). In addition, we examine if

there is a positive correlation between openness and the duration of active membership (H6c). We see a positive correlation between extraversion and the duration of membership ($r=0.322$, $p=0.005^*$) with a medium effect size. Besides, there is a highly significant negative relationship between neuroticism and the duration of membership ($r=-0.361$, $p=0.001^*$) with again being a medium effect size. The Pearson correlation between openness and duration is not significant ($r=-0.060$, $p=0.606$). Both hypotheses H6a and H6b are therefore supported whereas H6c has to be rejected.

Table 4 shows an overview of the main findings from hypothesis testing with significance levels (two-tailed).

Table 4. Overview of findings.

| <i>Result</i> | <i>Significance</i> |
|--|-----------------------------------|
| H2a: Negative relationship between conscientiousness and visit duration. | $r=-0.169$, $p=0.032^*$ |
| H2b: Negative relationship between conscientiousness and usage frequency. | $r=-0.056$, $p=0.483$ |
| H3a: Positive relationship between extraversion and # of followers. | $r=0.22$, $p=0.02^*$ |
| H3b: Positive relationship between extraversion and # of followings. | $r=0.20$, $p=0.04^*$ |
| H4: Positive relationship between extraversion and average # of posts per day. | $r=0.019$, $p=0.868$ |
| H5: Users with private profiles are higher in agreeableness. | $df=103$, $t=-2.07$, $p=0.04^*$ |
| H6a: Positive relationship between extraversion and duration of membership. | $r=0.322$, $p=0.005^*$ |
| H6b: Negative relationship between neuroticism and duration of membership. | $r=-0.361$, $p=0.001^*$ |

5 Discussion

While it has been shown that in case of Facebook, users differ significantly in their personality traits from non-users [37], our analysis did not show a similar pattern in case of Instagram users (H1 rejected). Based on our sample, we see no significant differences in any of the personality traits – openness, conscientiousness, extraversion, agreeableness, neuroticism – of users of Instagram in comparison to individuals who do not use the platform. Our result implies that Instagram users do not have any special personality in general. With one billion active users [39], the visual content-based platform seems to attract a wide variety of different kinds of users and therefore seems to not only be relevant for individuals with specific personality traits.

Upon comparing two different platforms, Facebook users have been shown to be more extraverted and conscientious in comparison to our Instagram sample [37]. With respect to the personality dimension extraversion, prior research revealed a mean of 3.09 (SD=0.76) in case of Facebook users whereas our Instagram sample scored a mean of 2.20 (SD=0.56). Looking at the dimension conscientiousness, Facebook users have

been reported to have a mean of 3.36 (SD=0.55). In comparison, Instagram users in our sample scored 2.49 (SD=0.63). Based on these two dimensions we see striking differences between the Facebook sample of [37] and our Instagram sample. However, prevalent differences could be explained due to time-related developments as the study related to Facebook has been conducted in 2011 and additionally used a different personality test (Big Five Inventory) [37].

Concerning specific usage patterns, we find a negative correlation between conscientiousness and the duration of Instagram usage (H2a supported). Individuals higher in conscientiousness tend to use Instagram for shorter periods and are less willing to spend much time on the platform. This is in line with research focusing on other SNS showing that highly conscientious individuals spend less time on SNS ([32], [23], [37], [45]) as such individuals aim to avoid unnecessary distraction [44]. Despite the particularities of Instagram in terms of having a focus on visually appealing content, this does not lead to users high in conscientiousness spending more time on the platform. In contrast, we found no significant relationship between conscientiousness and frequency of Instagram usage (H2b rejected). This means that highly conscientious individuals visit the platform as often as individuals scoring low in conscientiousness; however, if they visit the platform they tend to spend less time there.

Extroverted users tend to have a higher number of followers (H3a supported) and followings (H3b supported). Thus, it seems that extrovert Instagram users have more contacts and are more connected which is in line with studies based on Facebook showing similar results [1], [3], [29]. While extroverted Facebook users have many friends, extroverted Instagram users have many followers and followings. Our result shows that extroverted individuals have many connections with others not only in the “real world” [48] but also on Instagram. Extroverts seem to focus on the social value of SNSs and they have a stronger influence [11] in the form of a broad range of their contributions reasoned in the higher number of followings. Surprisingly, a higher extraversion of Instagram users does not seem to lead to increased publishing of content (H4 rejected). This is in contrast with results based on Facebook stating that extroverted users tend to more frequently post status updates and pictures [29]. User behavior on Instagram supports the view that extroverted people would not use their online activities as a substitute for their interaction in real life [4].

Users who set their profile to “private” have on average higher levels of agreeableness than users who set it to “public” (H5 supported). This result is consistent with the statement that users high in agreeableness tend to control their impression on others and that they are more selective about their images and text [15], [24]. Individuals high in agreeableness might want to have more control over their contributions submitted to Instagram. Setting a profile to “private” provides only a limited and controlled audience access to content which is available on the profile.

Our analysis shows that Instagram users scoring high on extraversion tend to have a longer duration of active membership on the platform (H6a supported). Early Instagram users are characterized by a more pronounced extraversion compared to users who joined later which might be no surprise as such individuals strive for self-expression and interaction [9]. In addition, our data reveal a significant negative relationship between neuroticism and duration of active membership on Instagram

(H6b supported). It has been shown that individuals with higher levels of neuroticism tend to have higher privacy concerns [46] which hinder their adoption of such services since they rather avoid them. In the context of the present study, we are able to empirically confirm that users who adopted the platform for a more extended period do have lower levels of neuroticism.

Our results further show that openness is not related to the duration of membership (H6c rejected). This is in contrast to studies who were able to show that openness is a predictor of earlier use of SNS [10]; however, this relationship could not be determined in the case of Instagram. A reason for this could be that Instagram was not innovative and from interest for individuals high in openness because many other photo sharing platforms like Flickr or Pinterest also existed in parallel. It can be summarized that early users of Instagram are characterized by more extraversion and less neuroticism, compared to users who joined later. This could be as less neurotic people are less anxious and thus more likely to engage in new ways of communicating [46]. Furthermore, privacy concerns may prevent more neurotic individuals from using photo-sharing services. For extroverted people, Instagram was initially a new communication channel and thus well suited as a platform for self-expression.

The results of this study lead to various implications. Many followers or followings are an expression of higher extraversion and private profiles are an expression of higher agreeableness. Moreover, short visit durations on Instagram seem to be an expression of higher conscientiousness. Our findings help to better understand how individual differences are linked to online activities on Instagram. From a practical side, the results may provide some useful insights for businesses operating SNSs. With the help of these user insights the targeting of customers can be improved. Besides, developers and marketers of new (photo-sharing) apps can keep in mind that early users of Instagram were higher in extraversion and lower in neuroticism than customers who joined the platform recently. These additional insights may be relevant to adjust and optimize marketing strategies and user experience over time to reach and attract the appropriate audience, especially in the first years of adoption. Our results also indicate that all kinds of individuals can be potentially reached on Instagram as Instagram users on average do not differentiate from the general population in their personality. Results (especially regarding the relationship between conscientiousness and time spent on Instagram) are still exploratory at this point but help to direct future research in this field.

6 Conclusion and Future Research

This study is one of the first which investigates to what extent users of Instagram differ from non-users in order to contribute to the identification of the types of people who use Instagram. Furthermore, we derive insights on which specific personality traits are related to different usage patterns on Instagram.

Our study is prone to some limitations. First, online surveys can only be accessed by individuals who use the Internet [8] which might exclude a specific group of individuals. Differences among the groups of Instagram users and non-users might differ if the survey is additionally conducted in the offline setting. In addition, for a

comparative study of this kind, a more complex personality inventory might be more appropriate to find differences. In future research, the revised NEO Personality Inventory (NEO-PI-R) could be used, which captures personality differences based on 240 items. In this inventory, each of the 5 personality traits has another 6 facets, each collected over a scale of 8 items. Thus, the NEO-PI-R offers the possibility of an even more differentiated personality description [5].

The results of the present study provide approaches for future research. In subsequent studies, cultural, demographic as well as regional differences could be considered to derive even further fine-grained insights. Furthermore, the dynamic character of the composition of the user structure on Instagram could be considered to observe the development of the personality structure of the users over a longer period. Further insights on the correlations of other unprecedented aspects of using Instagram could be derived, for example to what extent personality traits are related to the use of hashtags or the use of new features such as Instagram stories, stickers, quizzes and Instagram TV. Moreover, personality classification based on the OCEAN model can also be carried out in a more concrete context. Results that are more significant could be achieved through a direct contextual reference, such as election campaign, hate speech or fake news.

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References

1. Acopio, J. R. B., Bance, L. O.: Personality traits as predictors of Facebook use. *International Journal of Psychology and Counselling* 8, 45–52 (2016)
2. Amichai-Hamburger, Y.: Internet and personality. *Computers in Human Behavior* 18, 1–10 (2002)
3. Amichai-Hamburger, Y., Vinitzky, G.: Social network use and personality. *Computers in Human Behavior* 26, 6, 1289–1295 (2010)
4. Amiel, T., Sargent, S. L.: Individual differences in Internet usage motives. *Computers in Human Behavior* 20, 6, 711–726 (2004)
5. Asendorpf, J. B., Neyer, F. J.: *Psychologie der Persönlichkeit*. 5th Edition. Springer, Heidelberg (2012)
6. Bachrach, Y., Kosinski, M., Graepel, T., Kohli, P., Stillwell, D.: Personality and patterns of Facebook usage. In: *Proceedings of the 4th Annual ACM Web Science Conference*, pp. 24–32. ACM, New York (2012)
7. Borkenau, P., Ostendorf, F.: *NEO-FFI, NEO-Fünf-Faktoren-Inventar nach Costa und McCrae*. Manual. 2nd. Edition. Hogrefe, Göttingen (2008)
8. Bortz, J., Döring, N.: *Forschungsmethoden und Evaluation für Human- und Sozialwissenschaftler*. 4th Edition. Springer Medizin, Heidelberg (2006)

9. Brailovskaia, J., Bierhoff, H. W.: Sensationssuchende Narzissten, Extraversion und Selbstdarstellung in sozialen Netzwerken im Web 2.0. *Journal of Business and Media Psychology* 3, 2, 43–56 (2012)
10. Caci, B., Cardaci, M., Tabacchi, M. E., Scrima, F.: Personality variables as predictors of Facebook usage. *Psychological Reports* 114, 2, 528–539 (2014)
11. Chen, X., Pan, Y., Guo, B.: The influence of personality traits and social networks on the self-disclosure behavior of social network site users. *Internet Research* 26, 3, 566–586 (2016)
12. Cohen, J.: *Statistical power analysis for the behavioral sciences*. 2nd Edition. Lawrence Erlbaum Associates. Hillsdale, NJ (1988)
13. Correa, T., Hinsley, A. W., De Zuniga, H. G.: Who interacts on the Web? The intersection of users' personality and social media use. *Computers in Human Behavior* 26, 2, 247–253 (2010)
14. Costa, P. T., McCrae, R. R.: *The NEO PI/FFI manual supplement*. Psychological Assessment Resources. Odessa (1989)
15. Cox, B.: *Differential functioning by high and low impression management groups on a Big Five Applicant Screening Tool*. Auburn University (2010)
16. Devaraj, S., Easley, R. F., Crant, J. M.: Research note – How does personality matter? Relating the five-factor model to technology acceptance and use. *Information Systems Research* 19, 1, 93–105 (2008)
17. Ellison, N. B., Steinfield, C., Lampe, C.: The Benefits of Facebook Friends: Social Capital and College Students' Use of Online Social Network Sites. *Journal of Computer-Mediated Communication* 12, 4, 1143–1168 (2007)
18. Ferwerda, B., Schedl, M., Tkalcic, M.: Using Instagram picture features to predict users' personality. In: Tian, Q., Sebe, N., Qi, G.-J., Huet, B., Hong, R., Liu, X.: *Multimedia Modeling*, pp. 850–861. Springer, Cham (2016)
19. Ferwerda, B., Tkalcic, M.: You Are What You Post: What the Content of Instagram Pictures Tells About Users' Personality. *IUI Workshops* (2018)
20. Golbeck, J.: *Introduction to Social Media Investigation*. Elsevier, Waltham (2015)
21. Guadagno, R. E., Okdie, B. M., Eno, C. A.: Who blogs? Personality predictors of blogging. *Computers in Human Behavior* 24, 5, 1993–2004 (2008)
22. Hamid, N. A., Ishak, M. S., Yazam, S. S. N. M.: Facebook, YouTube and Instagram: exploring their effects on undergraduate students' personality traits. *The Journal of Social Media in Society* 4, 2, 138–165 (2015)
23. Hughes, D. J., Rowe, M., Batey, M., Lee, A.: A tale of two sites: Twitter vs. Facebook and the personality predictors of social media usage. *Computers in Human Behavior* 28, 2, 561–569 (2011)
24. Hunt, D. S., Langstedt, E.: The Influence of Personality Factors and Motives on Photographic Communication. *The Journal of Social Media in Society* 3, 2, 42–64 (2014)
25. John, O. P., Srivastava, S.: The Big Five Trait Taxonomy: History, Measurement, and Theoretical Perspectives. In: Pervin, L. A., John, O. P.: *Handbook of personality theory and research*, pp. 102–138. Guilford Press, New York (1999)
26. Kim, J. H., Kim, Y.: Instagram user characteristics and the color of their photos: Colorfulness, color diversity, and color harmony. *Information Processing & Management* 56, 4, 1494–1505 (2018)
27. Körner, A., Geyer, M., Brähler, E.: Das NEO-Fünf-Faktoren Inventar (NEO-FFI), Validierung anhand einer deutschen Bevölkerungsstichprobe. *Diagnostica* 48, 1, 19–27 (2002)

28. Landers, R. N., Lounsbury, J. W.: An investigation of Big Five and narrow personality traits in relation to Internet usage. *Computers in Human Behavior* 22, 2, 283–293 (2006)
29. Lee, E., Ahn, J., Kim, Y. J.: Personality traits and self-presentation at Facebook. *Personality and Individual Differences* 69, 162–167 (2014)
30. Lynn, T., Muzellec, L., Caemmerer, B., Turley, D.: Social network sites: early adopters' personality and influence. *Journal of Product & Brand Management* 26, 1, 42–51 (2017)
31. McCrae, R. R., John, O. P.: An introduction to the five-factor model and its applications. *Journal of Personality* 60, 2, 175–215 (1992)
32. McElroy, J. C., Hendrickson, A. R., Townsend, A. M., DeMarie, S. M.: Dispositional factors in internet use: personality versus cognitive style. *MIS quarterly* 31, 809–820 (2007)
33. Moore, K., McElroy, J. C.: The influence of personality on Facebook usage, wall postings, and regret. *Computers in Human Behavior* 28, 1, 267–274 (2012)
34. Petrocchi, N., Asnaani, A., Martinez, A. P., Nadkarni, A., Hofmann, S. G.: Differences between people who use only Facebook and those who use Facebook plus Twitter. *International Journal of Human-Computer Interaction* 31, 2, 157–165 (2015)
35. Quintelier, E., Theocharis, Y.: Online political engagement, Facebook, and personality traits. *Social Science Computer Review* 31, 3, 280–290 (2013)
36. Ross, C., Orr, E. S., Sisic, M., Arseneault, J. M., Simmering, M. G., Orr, R. R.: Personality and motivations associated with Facebook use. *Computers in Human Behavior* 52, 2, 578–586 (2009)
37. Ryan, T., Xenos, S.: Who uses Facebook? An investigation into the relationship between the Big Five, shyness, narcissism, loneliness, and Facebook usage. *Computers in Human Behavior* 27, 5, 1658–1664 (2011)
38. Sheldon, P., Bryant, K.: Instagram: Motives for its use and relationship to narcissism and contextual age. *Computers in Human Behavior* 58, 89–97 (2016)
39. Statista 2019a: Anzahl der monatlich aktiven Instagram Nutzer weltweit in ausgewählten Monaten von Januar 2013 bis Juni 2018 (in Millionen), <https://de.statista.com/statistik/daten/studie/300347/umfrage/monatlich-aktive-nutzer-mau-von-instagram-weltweit> (Accessed: 08.08.2019).
40. Statista 2019b: Projected revenue of Instagram from 2017 to 2019 (in billion U.S. dollars), <https://www.statista.com/statistics/271633/annual-revenue-of-instagram> (Accessed 08.08.2019).
41. Taber, L., Whittaker, S.: Personality Depends on The Medium: Differences in Self-Perception on Snapchat, Facebook and Offline. Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems. Paper No. 607, New York (2018)
42. Teh, P. L., Yong, C. C., Chong, C. W., Yew, S. Y.: Do the Big Five Personality Factors affect knowledge sharing behaviour? A study of Malaysian universities. *Malaysian Journal of Library & Information Science* 16, 1, 47–62 (2011)
43. Wang, J. L., Jackson, L. A., Zhang, D. J., Su, Z. Q.: The relationships among the Big Five Personality factors, self-esteem, narcissism, and sensation-seeking to Chinese University students' uses of social networking sites (SNSs). *Computers in Human Behavior* 28, 6, 2313–2319 (2012)
44. Wehrli, S.: Personality on social network sites: An application of the five factor Model. ETH Sociology Working Paper No. 7. Zürich (2008)
45. Wilson, K., Fornasier, S., White, K. M.: Psychological predictors of young adults' use of social networking sites. *Cyberpsychology, Behavior, and Social Networking* 13, 2, 173–177 (2010)

46. Xu, R., Frey, R. M., Fleisch, E., Ilic, A.: Understanding the impact of personality traits on mobile app adoption-Insights from a large-scale field study. *Computers in Human Behavior* 62, 244–256 (2016)
47. Zielgruppen bei Facebook: How to Connect with New Audiences on Instagram. <https://www.facebook.com/business/news/insights/how-to-connect-with-new-audiences-on-instagram> (Accessed: 15.11.2019).
48. Zywica, J., Danowski J.: The faces of Facebookers: investigating social enhancement and social compensation hypotheses; predicting Facebook™ and offline popularity from sociability and self-esteem, and mapping the meanings of popularity with semantic networks. *Journal of Computer-Mediated Communication* 14, 1, 1–34 (2008).