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Do personality characteristics explain the associations between self-esteem and online social networking behaviour?

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ABSTRACT

The relationships between online social networking (OSN) behaviour and users' self-esteem are as important as well as ambiguous: Both positive and negative self-esteem can encourage users to engage in OSNs. This work examined whether personality traits and attitudes toward traits can explain this controversy. Data from 830 users of Vk.com, a Russian OSN were analysed. I hypothesised that extraversion and attitudes toward extraversion eliminated correlations between positive self-esteem and users' popularity (the number of friends and likes). In contrast, neuroticism and attitudes toward neuroticism failed to eliminate a negative correlation between self-esteem and an indicator of users' self-validation (the number of impersonal avatars). This association also remained significant when conscientiousness as well as negative attitudes toward conscientiousness and agreeableness were controlled. However, self-esteem did not correlate with the two other self-validation indicators—the number of posts and portraits. This study casts doubt on the possibility of direct associations between positive self-esteem and users' popularity beyond such factors as extraversion. Nevertheless, it lends partial support to the association between negative self-esteem and users' self-validation such as the use of impersonal avatars even when other personality characteristics are considered.

1. Introduction

The problem of individual differences among the users of online social networks (OSN) has been attractive to researchers and practitioners over the last decade. On one hand, this is due the possibility of investigating various indicators of OSN behaviour—not only by using conventional self-reported data, but also by using objective behavioural markers (Gosling, Augustine, Vazire, Holtzman, & Gaddis, 2011; Wells & Link, 2014). On the other hand, this interest is because OSN behaviour is a vital and common feature of life to many people. Knowing why people differ between each other in their OSN behaviour is thus inherently non-trivial.

Self-esteem is traditionally an important place among the factors that determine differences between individuals. In a number of recent studies, self-esteem has also been investigated in the context of OSN user behaviour. The existing literature on the topic has a contradictory message. Here, I address the relationship between self-esteem and OSN users' behaviour, whether it is really important, and whether it masks other more substantial associations. A possible candidate for the latter might be personality traits and attitudes toward traits.

2. Background

2.1. Self-esteem in online social networks

Self-esteem is a characteristic of a person's reflection that defines one's personality in evaluative terms. It refers to the extent to which a person views the self as worthwhile and positive (Vogel, Rose, Roberts, & Eckles, 2014). The literature provides an impression on the inconsistent, though still important, role that self-esteem plays in OSN behaviour. Dong Liu and Roy Baumeister recently published a meta-analysis on the topic, and characterized their findings on the associations between self-esteem and OSN use as “puzzling” and “even more complicated when we examined specific social networking sites activities” (Liu & Baumeister, 2016, p. 85). The problem is that different aspects of users' activity have been associated with either positive or negative self-esteem.

The self-enhancement logic (e.g., Tice, 1992) suggests that positive self-esteem might stimulate more active behaviour from the users. Thus, OSNs are just another form of social circumstances in which individuals with positive self-esteem can confidently show themselves, which would lead them, for instance, to getting more likes on their

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profile pictures (Burrow & Rainone, 2017). For instance, the above-mentioned meta-analysis showed that positive self-esteem correlated with a higher number of friends (Liu & Baumeister, 2016). Moreover, the regular or even episodic use of OSNs can make one's self-esteem more positive (Gentile, Twenge, Freeman, & Campbell, 2012; Gonzales & Hancock, 2011; O'Sullivan & Hussain, 2017).

However, negative self-esteem can also urge users to actively operate in the OSN context. In this case, self-esteem can presumably play another compensatory role: Users with negative self-esteem may compensate their disadvantages in the offline reality (Lee, Moore, Park, & Park, 2012) and seek for happiness that can be treated as attention from others and validation from themselves. Thus, persons with negative self-esteem may compensate their offline failures by increasing their OSN activities (Eşkisu, Hoşoğlu, & Rasmussen, 2017; Lee et al., 2012). In particular, they were found to use an OSN more intensively than their positive self-esteem counterparts (Błachnio, Przepiorka, & Rudnicka, 2016; Ellison, Steinfield, & Lampe, 2007; Liu & Baumeister, 2016; Vogel et al., 2014) and even had a sort of *Facebook addiction* (Błachnio, Przepiorka, & Pantic, 2016; Hawi & Samaha, 2017). Negative self-esteem was associated with various specific forms of OSN activity related to self-validation (Mehdizadeh, 2010; Tazghini & Siedlecki, 2013).

Finally, several studies have obtained null relationships between self-esteem and OSN behaviour (Barry, Doucette, Loflin, Rivera-Hudson, & Herrington, 2017; Greitemeyer, 2016; O'Sullivan & Hussain, 2017; Skues, Williams, & Wise, 2012) or relationships that were mediated by some other variables (Tazghini & Siedlecki, 2013; Wang, Jackson, Zhang, & Su, 2012). Liu and Baumeister's (2016) meta-analysis showed that among the various OSN activity indicators, there was only one that correlated with self-esteem: the number of friends. Thus, a question arose in this context: Is it possible that the association between self-esteem and OSN behaviour is negligible at all, and all of these findings of association pertain to some other phenomenon that is more important in the OSN context? In this regard, personality traits and their derivatives could be important candidates.[1]

2.2. Personality characteristics and online social network activity

After almost a century of investigation in personality taxonomies and models of traits, researchers have come to a consensus that has been preserved for the last 20 years. Most scholars have accepted the five-factor structural model of personality or the Big Five—this includes elements of extraversion, agreeableness, conscientiousness, neuroticism, and openness to experience (Goldberg, 1981; McCrae & Costa, 2013). Many studies dedicated to the association between personality and OSN behaviour were prepared to address the Big Five (e.g., Darbyshire, Kirk, Wall, & Kaye, 2016; Muscanell & Guadagno, 2012; Ross et al., 2009).

Self-esteem differently correlates with each element of the Big Five: The strongest correlation was between negative self-esteem and neuroticism. In addition, extraversion and conscientiousness correlated moderately; agreeableness and openness correlated weakly with positive self-esteem (e.g., Franck, Raedt, Barbez, & Rosseel, 2008; Marshall, Lefringhausen, & Ferenczi, 2015; Robins, Tracy, Trzesniewski, Potter, & Gosling, 2001).

Personality traits have a number of derivative structures that extend beyond the traits themselves. These structures include meta-insight (Carlson, Vazire, & Furr, 2011), meta-accuracy (Stopfer, Egloff, Nestler, & Back, 2014), or general evaluative component (Bäckström & Björklund, 2014). Another characteristic is attitudes toward personality traits (Shchebetenko, 2014, 2016). They represent bipolar (positive vs. negative) evaluations of a given trait by an individual. Such evaluations have no direct reference to any particular person including the individual they are held by. Attitudes toward traits could be a parameter of interest in this context.

3. Current study

This study investigated whether self-esteem correlates with OSN behaviour after statistical control for personality traits and attitudes toward traits. In line with previous research, I assumed that positive self-esteem would correlate with those OSN indicators that characterise users' popularity. The core characteristics of extraversion are sociability and assertiveness (Saucier & Ostendorf, 1999; Soto & John, 2017). Accordingly, extraversion is an appropriate candidate for explaining the association between users' positive self-esteem and their OSN popularity. Extraversion has been shown to correlate with positive self-esteem and is an important predictor of various OSN activities (Gosling et al., 2011) including an increased number of OSN friends (Lönnqvist, Itkonen, Verkasalo, & Poutvaara, 2014; Shen, Brdiczka, & Liu, 2015). At the same time, extraversion did not predict the variation in the numbers of posts published by the users (große Deters, Mehl, & Eid, 2016). This means that extraversion may relate to users' popularity rather than to their self-validation.

In contrast, self-validation of OSN users is presumed to be an important feature that correlates to their negative self-esteem. At the same time, neuroticism (Thomson, 2016) and its aspects like social anxiety (groβe Deters et al., 2016) are personality traits that are relevant to self-validation. Given the strong association between negative self-esteem and neuroticism, the hypothesised correlations between the self-validation OSN indicators and self-esteem were supposed to be eliminated by this trait and by attitudes toward it.

To summarize, the following hypotheses were tested:

1. Correlations between positive self-esteem and OSN indicators of popularity are statistically eliminated when extraversion and attitudes toward extraversion are added as predictors to the regression model.
2. Correlations between negative self-esteem and OSN indicators of self-validation are statistically eliminated when neuroticism and attitudes toward neuroticism are added as predictors to the regression model.

The role of the remaining Big Five traits in the associations between self-esteem and each OSN indicator was also examined post hoc.

4. Method

4.1. Participants

Participants (n = 830) were taken from a larger sample of undergraduates who had profiles on Vk.com, a Russian OSN. The participants were aged from 17 to 38 years (M = 19.59, SD = 1.53) including 597 women (71.9%). One participant did not indicate her age. Prior to the study, the participants provided informed consent. They were told to report their full names to avoid any mistakes during the preparation and mailing of the feedback materials. Five to six months after completion of the study, the participants received emails containing the results of the personality trait assessments and the study debriefing.

The full name information provided by the participants was used to search their profiles on Vk. The profile information was used only if it could be obtained freely. Specifically, the participants were not added as friends to my personal Vk profile; therefore, the data used here were published by the participants and were available to any non-friend user

[1] Self-esteem is methodologically a product of self-reported measures similar to personality traits; however, it conceptually differs from the latter. Whereas traits concern one's opinion on one's own *behaviour*, self-esteem concerns one's *evaluation*—mostly in ethical terms. Therefore, self-esteem is conceptually not a disposition—it is not an inclination to behave in some particular ways but an evaluation of one's self and one's own behaviour.

of Vk.

4.2. Measures

4.2.1. Questionnaires

The participants were presented with a Russian version (Shchebetenko, 2014) of the 44-item Big Five Inventory (BFI; John, Naumann, & Soto, 2008) and its modification aimed to measure attitudes toward traits. The BFI personality trait subscales demonstrated acceptable internal consistency, α = 0.79, 0.66, 0.79, 0.78, 0.81, for extraversion, agreeableness, conscientiousness, neuroticism, and openness, respectively.

To evaluate attitudes toward traits, BFI was modified by changing the instructions, the scale, and various phrases. The following instructions preceded the pool of items:

Please indicate what you think about the personality characteristics listed below. Do you find the characteristic in question to be positive or negative? It does not matter whether you have this particular characteristic or not: simply *evaluate* it as it is.

The participants rated each item on a 5-point scale anchored from 1 (*a very bad trait*) to 5 (*a very good trait*). The item wordings were modified slightly to correspond with the scale and the instructions. For example, item 1 was changed from … *is talkative* in the original version to … *talkativeness* in the BFI attitude version and item 2 was changed from … *tends to find fault with others* to … *tendency to find fault with others*. The BFI attitudes toward traits subscales demonstrated acceptable internal consistency, α = 0.69, 0.72, 0.70, 0.77, for agreeableness, conscientiousness, neuroticism, and openness, respectively. The attitude toward extraversion subscale showed poor internal consistency, α = 0.55. To improve it, three items were dropped: *reserve*, *generation of strong enthusiasm*, and *shyness*. Afterwards, internal consistency became acceptable, α = 0.67.

To measure self-esteem, the 10-item 4-point Rosenberg Self-Esteem Scale (Rosenberg, 1965) was used. The scale showed good internal consistency, α = 0.81.

4.2.2. OSN indicators

Five OSN indicators were used: The total number of friends and median “likes” marking a portrait by the user were treated as OSN indicators of the users' popularity. The number of posts published by the users on their walls, the number of avatars[2] representing photographs of the users without other people or animals (termed “portraits”), and the number of impersonal avatars depicting other people, animals, or abstract figures were used as OSN indicators of users' self-validation.[3]

The OSN indicators in this study were count variables with low arithmetic means that could only take non-negative integer values because they reflect counts of events (e.g., the number of friends). Moreover, the score distributions of the OSN indicators did not meet conditional normality (see Supplementary materials for the distribution plots): positive skewness and kurtosis were regularly observed (Table S2). In such cases, the use of the Poisson regression analysis is recommended instead of ordinary least squares regression (Coxe, West, & Aiken, 2009). However, the variance of the OSN parameters substantially exceeded their means in this study. This condition is known as overdispersion (Coxe et al., 2009), and it violates the standard Poisson regression analysis assumption of equidispersion (i.e. the equality of the mean and the variance of a parameter). Consequently, I used the negative binomial regression model—a special case of Poisson regression, that facilitates heterogeneity between individuals (Coxe et al., 2009). Thus, self-esteem, personality traits and attitudes toward them were to be continuous predictors; the OSN indicators were treated as dependent variables.

[2] Graphical representations of the user or the user's character.

[3] Since there are many different motives for using OSNs (Marshall et al., 2015), I preliminarily conducted a varimax-rotated principal component analysis with these five OSN indicators (see Supplement materials for details). Two components had an eigenvalue of greater than 1. The number of likes and friends strongly loaded on the first component with weights over 0.76; the remaining three indicators were strongly loaded on the second component with loadings being at least 0.64. Accordingly, I interpreted the first component as Popularity, and the second component was treated as Self-Validation.

5. Results

5.1. The correlations between self-esteem and personality characteristics

Pearson correlations between self-esteem and each personality trait separately were first examined separately. Similar to previous findings, positive self-esteem correlated with extraversion, agreeableness, conscientiousness, emotional stability, and openness. The correlations of self-esteem with extraversion (0.38) and neuroticism (−0.36) were moderate. The associations of self-esteem with conscientiousness (0.29), openness (0.16), and agreeableness (0.09) were small. The correlations of self-esteem with attitudes toward the traits corresponded to the correlations of self-esteem with respective traits but with smaller sizes: *r*s = 0.22, 0.14,.-0.13, 0.08, for attitudes toward extraversion, conscientiousness, neuroticism, and openness, respectively. The link between self-esteem and attitude toward agreeableness was statistically non-significant (0.03).

5.2. The relationship between self-esteem and personality characteristics with OSN behaviour

As expected, positive self-esteem correlated with both popularity indicators—the number of friends and likes. The values of exponential *B*s can be interpreted such that a person with a self-esteem score of *X* is expected to have 1.18 times as many friends and 1.17 times as many likes per portrait as a person with a self-esteem score of *X-1*. Self-esteem also negatively correlated with the number of impersonal avatars but with the number of posts and portraits (Table 1).

Extraversion positively correlated with popularity indicators. It also correlated with two self-validation indicators but with the opposite signs; in particular, extraversion was positively related to the number of portraits but negatively to the number of impersonal avatars. Neuroticism positively correlated with the number of posts and portraits—two indicators of self-validation. Importantly, neuroticism and the number of impersonal avatars showed a null relationship although the latter correlated with self-esteem.

Attitudes toward extraversion reproduced the pattern that emerged for the correlations between trait extraversion and the OSN indicators but with larger effect sizes. Attitudes toward neuroticism positively correlated with the number of impersonal avatars and negatively with the number of posts.

The post hoc analysis showed that conscientiousness negatively correlated with the number of impersonal avatars whereas openness positively correlated with four out of five OSN indicators except for the number of impersonal avatars. Attitudes toward openness reproduced the pattern of associations between trait openness and the OSN indicators but with smaller sizes. Attitudes toward agreeableness and conscientiousness negatively correlated with the number of impersonal avatars; the former also positively correlated with the number of posts.

5.3. Self-esteem and online social networking behaviour: the eliminating role of personality characteristics

5.3.1. Introduction

A series of negative binomial regression models were conducted to test the hypotheses. In these analyses, self-esteem—either extraversion or neuroticism—and the attitude toward either trait were simultaneously included into the model as three predictors. In particular, a popularity indicator was used as the dependent variable when

Table 1
The associations of self-esteem and personality characteristics with online social networking behaviour indicators (n = 830).

	Online social networking behaviour indicators				
	Posts	Portraits	Impersonal avatars	Friends	Likes
Self-esteem	−0.13 [-0.27; 0.01] (0.88 [0.76; 1.00])	0.07 [-0.08; 0.22] (1.07 [0.92; 1.24])	**−0.67 [-0.85; -0.49] (0.51 [0.43; 0.61])**	0.17 [0.02; 0.32]* (1.18 [1.02; 1.37])	0.16 [0.01; 0.32]* (1.17 [1.01; 1.38])
Extraversion	0.08 [-0.02; 0.18] (1.08 [0.98; 1.19])	**0.24 [0.14; 0.35] (1.28 [1.15; 1.42])**	**−0.35 [-0.47; -0.23] (0.71 [0.63; 0.80])**	**0.34 [0.25; 0.44] (1.41 [1.28; 1.55])**	**0.30 [0.20; 0.40] (1.35 [1.22; 1.49])**
Agreeableness	0.07 [-0.04; 0.19] (1.08 [0.96; 1.21])	0.02 [-0.10; 0.15] (1.02 [0.90; 1.16])	−0.16 [-0.33; 0.01] (0.85 [0.72; 1.01])	0.09 [-0.03; 0.21] (1.10 [0.97; 1.24])	−0.07 [-0.20; 0.05] (0.93 [0.82; 1.05])
Conscientiousness	−0.06 [-0.16; 0.04] (0.94 [0.85; 1.04])	0.11 [-0.01; 0.22] (1.11 [0.99; 1.24])	**−0.56 [-0.68; -0.43] (0.57 [0.51; 0.65])**	0.02 [-0.09; 0.13] (1.02 [0.92; 1.14])	0.08 [-0.03; 0.19] (1.08 [0.97; 1.21])
Neuroticism	0.10 [0.01; 0.19]* (1.11 [1.01; 1.21])	0.15 [0.05; 0.26]** (1.16 [1.05; 1.29])	0.08 [-0.04; 0.20] (1.08 [0.96; 1.22])	−0.04 [-0.14; 0.05] (0.96 [0.87; 1.05])	0.04 [-0.06; 0.14] (1.04 [0.94; 1.15])
Openness	**0.37 [0.26; 0.47] (1.44 [1.30; 1.61])**	**0.25 [0.13; 0.36] (1.28 [1.14; 1.43])**	0.06 [-0.08; 0.19] (1.06 [0.93; 1.22])	**0.19 [0.09; 0.30] (1.21 [1.10; 1.35])**	0.12 [0.01; 0.22]* (1.13 [1.01; 1.25])
Attitude toward Extraversion	-.21 [-0.35; −0.06]** (0.81 [0.70; 0.94])	0.22 [0.05; 0.38]* (1.24 [1.05; 1.46])	**−1.14 [-1.33;-0.95] (0.32 [0.26; 0.39])**	**0.27 [0.13; 0.42] (1.31 [1.13; 1.52])**	**0.37 [0.21; 0.53] (1.45 [1.24; 1.69])**
Attitude toward Agreeableness	0.24 [0.10; 0.38]** (1.27 [1.11; 1.46])	0.05 [-0.11; 0.21] (1.06 [0.90; 1.24])	**−0.44 [-0.64;-0.24] (0.64 [0.53; 0.78])**	0.13 [-0.02; 0.28] (1.14 [0.98; 1.33])	0.10 [-.06; 0.26] (1.11 [0.95; 1.30])
Attitude toward Conscientiousness	0.04 [-0.13; 0.20] (1.04 [0.88; 1.22])	0.19 [-0.01; 0.39] (1.21 [0.99; 1.47])	**−0.71 [-0.93;-0.49] (0.49 [0.39; 0.61])**	0.11 [-0.07; 0.29] (1.11 [0.93; 1.33])	0.10 [-0.07; 0.28] (1.11 [0.93; 1.33])
Attitude toward Neuroticism	−0.24 [-0.39; −.09]** (0.79 [0.68; 0.91])	−0.02 [-0.20; 0.16] (0.98 [0.82; 1.18])	0.21 [0.01; 0.41]* (1.23 [1.01; 1.50])	−0.06 [-0.22; 0.11] (0.94 [0.80; 1.11])	0.13 [-0.04; 0.31] (1.14 [0.96; 1.36])
Attitude toward Openness	**0.44 [0.28; 0.60] (1.56 [1.33; 1.83])**	**0.31 [0.14; 0.48] (1.36 [1.15; 1.61])**	−0.16 [-0.34; 0.03] (0.85 [0.71; 1.03])	0.15 [-0.01; 0.31] (1.16 [0.99; 1.36])	0.16 [-0.00; 0.33] (1.18 [1.00; 1.39])

Note. Values in the cells are raw regression coefficients B calculated using negative binomial models of Poisson regression analysis. Self-esteem, personality traits and attitudes toward traits were treated as predictors; online social networking indicators were treated as dependent variables. Values in parentheses are exponential parameter estimates. 95% Wald confidence intervals are in brackets. Posts –number of posts published by users on their profile walls. Portraits – number of avatars depicting the user without other people or animals. Impersonal avatars – number of avatars not depicting the user but some other people, animals, inanimate objects, or abstract figures instead. Friends – the number of friends. Likes – median number of likes per portrait. Bolded values were statistically significant at $p < .001$. $^{**}p < .01$, $^{*}p < .05$.

Table 2
Multiple predictions of OSN activity via self-esteem, extraversion, neuroticism, and attitudes toward them.

Predictors	Traits/Dependent variables		
	E/Friends	E/Likes	N/Impersonal avatars
Self-esteem	−0.03 [-0.19; 0.12] (0.97 [0.83; 1.13])	−0.01 [-0.18; 0.15] (0.99 [0.83; 1.16])	**−0.72 [-0.92; -0.53] (0.49 [0.40; 0.59])**
Trait	**0.35 [0.23; 0.46] (1.42 [1.26; 1.59])**	**0.25 [0.13; 0.37] (1.28 [1.13; 1.44])**	−0.12 [-0.25; 0.01] (0.89 [0.78; 1.01])
Attitude toward trait	0.02 [-0.15; 0.19] (1.02 [0.86; 1.21])	0.20 [0.02; 0.37]* (1.22 [1.02; 1.45])	0.16 [-0.04; 0.36] (1.18 [0.96; 1.44])

Note. $n = 830$. Values in the cells are raw regression coefficients *B* calculated using negative binomial models of Poisson regression analysis. Values in parentheses are exponential parameter estimates. 95% Wald confidence intervals are in brackets. E − extraversion, N – neuroticism. Bolded values were statistically significant at $p < .001$. $^{**}p < .01$, $^{*}p < .05$.

extraversion was included; this tested Hypothesis 1. When neuroticism was included, the number of impersonal avatars as a self-validation indicator was used as a dependent variable; this tested Hypothesis 2. The analyses were not performed for the numbers of posts and portraits because these indicators did not correlate with self-esteem (see Table 1).

Supplementary post hoc analysis examined the contribution of the remaining three traits (and attitudes toward them) to the OSN indicators beyond self-esteem. A negative binomial regression model was also employed.

5.3.2. Hypothesis 1: the role of extraversion in the association between self-esteem and OSN popularity

The correlation between self-esteem and the number of friends was not significant when extraversion and attitudes toward extraversion were added as predictors. Meanwhile, the contribution of trait extraversion to the number of friends remained significant beyond the contribution of self-esteem and attitudes toward extraversion (Table 2). Similarly, the correlation between self-esteem and the number of likes became insignificant when extraversion and attitudes toward extraversion were added as predictors. Importantly, both extraversion and attitudes toward extraversion correlated with the number of likes when self-esteem was fixed. In general, the number of likes increased the most when the users were both extraverted and had a positive attitude toward extraversion. While self-esteem correlated with both indicators of popularity, these associations can be basically explained by the correlation between self-esteem and extraversion. These results support Hypothesis 1.

5.3.3. Hypothesis 2: the role of neuroticism in the association between self-esteem and OSN self-validation

The negative association between self-esteem and the number of impersonal avatars remained significant when neuroticism and attitudes toward it were introduced as predictors (Table 2). This result rejects Hypothesis 2.

5.3.4. Post hoc analyses: the role of the remaining personality characteristics in the OSN indicators

The remaining personality characteristics also correlated with various OSN indicators, and the incremental role of the personality characteristics beyond self-esteem were also investigated. However, these findings are purely exploratory because no hypotheses were proposed.

Similar to extraversion, the associations between self-esteem and both popularity indicators were not significant when openness to experience was added to the model. In contrast, the negative association between self-esteem and the number of impersonal avatars remained significant when characteristics of either agreeableness or conscientiousness were included (Table 3).

6. Discussion

This work examined whether self-esteem would correlate with OSN activity above and beyond its associations with personality traits and attitudes toward them. There were three groups of results. The first group relates to Hypothesis 1, which presumed that users' extraversion and attitudes toward it eliminate the association between positive self-esteem and those OSN indicators that relate to users' popularity. The current findings confirmed these expectations: Extraversion eliminated the links between self-esteem and two popularity indicators—the number of friends and likes received by users' portraits. In particular, these findings demonstrate that the previously obtained meta-analytical association between self-esteem and the number of friends (Liu & Baumeister, 2016) can be a result of a positive covariation between self-esteem and extraversion. Extraversion can encourage users to employ OSN as a source for communication with others (Marshall et al., 2015; Ryan & Xenos, 2011). In the long run, extraversion can underlie users' popularity, but not high self-esteem itself.

The second group of findings relates to Hypothesis 2, which presumed that neuroticism and users' attitude toward neuroticism are responsible for the association between negative self-esteem and OSN indicators of users' self-validation. These hypotheses have been rejected in two ways. First, neither neuroticism nor attitudes toward neuroticism could eliminate the association between negative self-esteem and increased number of impersonal avatars—the only self-validation indicator that correlated with self-esteem. Hence, in cases like this, low self-esteem can be a predictor of increased self-validation OSN activity above and beyond any individual differences in neuroticism. The further post hoc analysis also demonstrated that the remaining Big Five traits failed to eliminate this association as well. Liu and Baumeister

Table 3
Multiple predictions of OSN activity via self-esteem, agreeableness, conscientiousness, openness to experience, and attitudes toward them.

Predictors	Traits/Dependent variables			
	A/Imp. avatars	C/Imp. avatars	O/Friends	O/Likes
Self-esteem	**−0.65 [-0.83; -0.47] (0.52 [0.43; 0.63])**	**−0.41 [-0.61; -0.22] (0.66 [0.54; 0.80])**	0.13 [-0.02; 0.28] (1.14 [0.98; 1.32])	0.14 [-0.02; 0.30] (1.15 [0.98; 1.35])
Trait	0.08 [-0.11; 0.28] (1.09 [0.89; 1.32])	**−0.39 [-0.52; -0.25] (0.68 [0.59; 0.78])**	0.20 [0.07; 0.34]** (1.22 [1.07; 1.40])	0.07 [-0.06; 0.20] (1.07 [0.94; 1.22])
Attitude toward trait	**−0.44 [-0.67; -0.21] (0.64 [0.51; 0.81])**	**−0.42 [-0.65; -0.19] (0.66 [0.52; 0.83])**	−0.05 [-0.26; 0.15] (0.95 [0.77; 1.16])	0.09 [-0.12; 0.29] (1.09 [0.89; 1.34])

Note. $n = 830$. Values in the cells are raw regression coefficients *B* calculated using negative binomial models of Poisson regression analysis. Values in parentheses are exponential parameter estimates. 95% Wald confidence intervals are in brackets. A – agreeableness, C – conscientiousness, O – openness to experience, Imp. Avatars – impersonal avatars. Bolded values were statistically significant at $p < .001$. $^{**}p < .01$, $^{*}p < .05$.

(2016) in their meta-analysis failed to find any significant negative associations between self-esteem and specific OSN indicators although they did find a weak but statistically significant correlation between self-esteem and overall OSN use, $r = -0.09$. While they mentioned "photos of personally meaningful or interesting scenes" as a relevant OSN behaviour (Liu and Baumeister (2016): P. 80), they did not investigate this indicator explicitly. This work shows an association between negative self-esteem and the use of such photos (i.e. impersonal avatars). This association remained significant beyond any personality characteristics.

The reasons for the association between negative self-esteem and the number of impersonal avatars can be twofold. First, the use of impersonal avatars can be a compensation to promote oneself in light of one's presumed physical unattractiveness. Users can avoid utilising portraits as avatars and can try to "harvest likes" (Andreassen, Pallesen, & Griffiths, 2017) by demonstrating their intellectual and aesthetical attractiveness via various impersonal photos. This line of reasoning is compatible with ideas on self-promotional OSN activity of low self-esteem users (Eşkisu et al., 2017; Mehdizadeh, 2010). Second, impersonal avatars in a social networking context can partially depersonalize oneself in the personalized OSN environment. Although I examined only those profiles that can be clearly attributed to particular individuals, some users could still decrease the level of identification by regularly employing impersonal pictures instead of clearly identifying portraits. Thus, such users can administer their profiles as if they are anonymous; presumably they are users with negative self-esteem.

The third group of findings should be considered clearly exploratory because no hypotheses were initially proposed. This study supports the idea that conscientiousness is a negative correlate of self-validation activity (Seidman, 2013)—at least in terms of using impersonal avatars. In other words, the use of impersonal avatars can also be a tool for procrastination which is a function of low conscientiousness (van Eerde, 2003; Watson, 2001), or even of a positive evaluation of procrastination as a kind of negative attitude toward conscientiousness. Again, this outcome is inconclusive because conscientiousness did not correlate with the other two self-validation indicators—the number of posts and portrait avatars.

Attitudes toward traits have shown to be an important correlate of OSN activity. Thus, a positive attitude toward extraversion correlated with an increased number of likes even when self-esteem and trait extraversion were controlled. Similarly, negative attitudes toward agreeableness and conscientiousness correlated with an increased number of impersonal avatars beyond the contribution of self-esteem and respective traits. Presumably, users' opinions on personality without any direct reference to their own persons can still urge them to regulate their actions. For instance, people who believe that it is good to be impulsive (i.e., having negative attitudes toward agreeableness and conscientiousness) can present themselves in some unconventional way via impersonal avatars even when they report their own personality is agreeable or conscientious. Similarly, users who describe themselves as introverted but meanwhile believe extraversion to be a good trait can still demonstrate sociable and assertive OSN behaviour—this would eventually result in more likes for their portraits.

More generally, this study demonstrated that self-esteem may have weaker associations with the OSN indicators versus various personality traits and attitudes toward them. Another important aspect of this work is that the findings obtained from Vk.com mostly correspond to the existing literature including self-reports from Facebook users. This means that OSN behaviour is a consistent characteristic that covers various Internet contexts and methods.

This study has a number of limitations. First, it used a student sample, which can deviate from the general OSN user population. Second, this study is cross-sectional, which clearly precludes drawing any causal inferences despite the use of regression models. Thus, future research may investigate if changes and fluctuations in self-esteem affect OSN actions in various timepoints, and if personality can mediate these effects. Third, as in many other instances, personality traits were measured with self-reports. On the other hand, peer-reports collected from OSN friends offer an important perspective on the contribution of personality characteristics to the OSN activity. Thus, users could underestimate their neuroticism to ultimately affect the obtained findings; OSN friend-reported neuroticism might remain an important factor affecting the association between self-esteem and the number of impersonal avatars. Finally, the OSN indicators lacked important details that might shed further light on the research questions. For example, posts were not differentiated in terms of length, content (music, text, etc), emotional positivity/negativity, etc.

This study only partially supports the idea that self-esteem can drive OSN activity. At best, it is related to some of self-validation behaviour. This study questions the possibility of any substantial associations between self-esteem and OSN behaviour. It failed to confirm that self-esteem itself can boost users' popularity, although certain relevant findings were previously reported. In these cases we must take a closer look at extraversion and attitudes toward it as the true reason for such correlations.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.chb.2018.09.017.

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