



Blumer, T., & Doering, N. (2012). Are we the same online? The expression of the five factor personality traits on the computer and the Internet. *Cyberpsychology: Journal of Psychosocial Research on Cyberspace*, 6(3), article 5. doi: [10.5817/CP2012-3-5](https://doi.org/10.5817/CP2012-3-5)

Are we the same online? The expression of the five factor personality traits on the computer and the Internet

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Abstract

The article distinguishes between different perspectives of contemporary research on personality and Internet usage. An open question concerns how personality is expressed on the Internet. Although some authors postulate a structural change of personality on the Internet, the precondition of cross-situational consistency rather speaks for just a different, situation-dependent expression of personality on the Internet. This study provides an initial empirical approach to the question of whether the five factor personality traits – exemplary for the whole personality of a person – express differently on the computer and on the Internet. Therefore, the five factors of 122 student participants were measured by the NEO-FFI. In a second step, the same subjects completed a modified version of the NEO-FFI, in which all items refer to computer-mediated communication. Results indicate that with regard to four of the five factors, the absolute influence of personality on behavior and experience decreases in favor of situational impact. In the case of neuroticism, a different effect occurred. On the computer and the Internet participants report higher emotional stability than in the offline world.

Keywords: big five, five factors, computer-mediated communication, person-situation controversy, cross-situational consistency

doi: [10.5817/CP2012-3-5](https://doi.org/10.5817/CP2012-3-5)

Introduction

Personality-psychological Internet research examines the relationship between the personality of Internet users (or even non-users) and miscellaneous aspects of choice, usage, and impact of online communication and interaction. Ryckman (2008) defines personality as a "dynamic and organized set of characteristics possessed by a person that uniquely influences his or her cognitions, motivations, and behaviors in various situations" (p. 4). Personality-psychological Internet research mainly refers to trait approaches of personality psychology. Trait psychology as a branch of personality psychology attempts to describe personality with the help of specific personality traits (such as extraversion, shyness or narcissism). Trait-psychological Internet research has often addressed the relationship between the five factor personality traits (Costa & McCrae, 1985, see below) and online behavior. Some authors suggest that the five traits might explain individual differences in online behavior (such as choice of content or preferences for services) whereas others suppose that the traits or their expression alter systematically on the Internet. However, personality traits are, by definition, independent of situational influence and constitute consistent aspects of behavior across situations. This postulate is known as cross-situational consistency of personality. Since many studies have reported a systematic change of behavior on the computer and the Internet (e.g. Amichai-Hamburger & Vinitzky, 2010), the question arises to what extent personality is associated with these behavioral changes. According to the cross-situational consistency of personality traits, these changes might be induced by an interaction of personality and contextual conditions of the online environment. In this case, just the expression of personality would be different; personality itself would remain the same.

This paper deals with personality expression on the computer and on the Internet and presents the results of an empirical study, which examined whether human behavior, emotion, and cognition vary systematically on the computer and the Internet. Previous research on this question mainly refers to specific, single personality traits (e.g. extraversion or shyness). In the following, the entire personality based on five global traits - the five factors - will be analyzed with regard to online behavior, emotion, and cognition. In the first part of the article, research on the relationship between the five factor personality traits and Internet use is presented. Subsequently, approaches concerning the relationship between personality and online behavior are systematized according to their assumed cause-effect relationships. The empirical part reports the results of a questionnaire study, which examined the expression of the five factors on the computer and the Internet.

Five factors online

There is a great deal of media-psychological investigations, which are using the five factor personality traits (Amichai-Hamburger & Vinitzky, 2010; Landers & Lounsbury, 2006; Muscanell & Guadagno, 2011; Ross et al., 2009; Wehrl, 2008) or single components of the five factors to explain differences in online behavior. The five factors (Costa & McCrae, 1985) or the Big Five (Goldberg, 1981) currently constitute the most common model of trait psychology. Including the components neuroticism, extraversion, openness to experience (sometimes intellect or culture cp. McCrae & Costa, 1997), agreeableness, and conscientiousness, the classification has found wide acceptance among psychological scholars for being both *broad* (providing a maximum spectrum of different traits) and *efficient* (using a minimum set of components) at the same time (Matthews, Deary, & Whiteman, 2003). Previous research on single components of the five factors and computer-mediated communication has led to diverse findings. In the following, studies are presented, which examine the influence of the five traits on the choice and usage of online services and, otherwise, studies, which investigate the specific effects of computer-mediated communication on the five factors.

- Neuroticism. Neuroticism reflects feelings such as anxiety, anger, distress, and depression. People scoring low on neuroticism are described emotionally stable. The interrelation between neuroticism on the one hand and frequency and intensity of use of online services on the other hand is not clear yet. There is some evidence that people scoring high on neuroticism use social media services such as blogs and Facebook more frequently than people with lower scores (Correa, Hinsley, & de Zuñiga, 2010; Guadagno, Okdie, & Eno, 2008;

Ross et al., 2009). However, Tuten, Bosnjak, and Studies (2001) reported a negative relation to the overall Internet usage.

Concerning the expression of neurotic behavior online results are inconsistent, too. Some evidence suggests that emotional stability increases in online communication. In particular, people suffering from social exclusion often use the opportunity to find like-minded others and, thus, learn how to get along with problems including issues of mental health, sexual orientations or disabilities (Blumer & Renneberg, 2010). On the other hand, there is also some evidence that particularly emotionally unstable people often run the risk of addictive behavior on the Internet (Hardie & Tee, 2007; Li, Yang, & Mingxin, 2006; Mehroof & Griffiths, 2010).

- **Extraversion.** Extraverted individuals are sociable, gregarious, and outgoing whereas introverts are reserved, highly deliberate, and enjoy spending time alone. Concerning the absolute frequency and intensity of Internet usage in general or single services and applications in particular, results are inconsistent. Landers and Lounsbury (2006) reported that introverted people seem to use the Internet more often and more intensively than extraverted people. Accordingly, Correa et al. (2010) showed that extraversion is positively related to social media use, while Ross et al. found no correlation between the time spent online or the use of communicative Facebook features (Ross et al., 2009).

Studies on extraverted or introverted behavior online have shown that computer-mediated communication might result in more outgoing behavior especially among extremely introverted or shy people (Amichai-Hamburger, Wainapel, & Fox, 2002; McKenna & Bargh, 2000). The authors argue that the perceived anonymity and distance of computer-mediated communication help overcome social inhibitions. This is consistent with the poor-get-richer-theory, after which inequity between individuals is reduced. In turn, other findings indicated that also extraverted individuals benefit from online communication and retain social dominance (Amichai-Hamburger, Kaplan, & Dorpatcheon, 2008). This would speak for the rich-get-richer-theory (Matthew Effect, see Merton, 1968).

- **Openness for experience.** Openness for experience is associated with curiosity and appreciation for artistic pursuits, alternative ideas and perspectives. Low scorers have more conservative and common interests. They rather avoid being exposed to controvert or ambiguous content and ideas. Due to the great variety of information and services online, it might be reasonable that open individuals use the Internet intensively to look for information and gain new insights (Tuten & Bosnjak, 2001). Some recent studies could show that the use of new online services, such as blogs and social media is positively related to openness for experience (Correa et al., 2010; Guadagno et al., 2008). Thus, people who are often called *early adopters* are likely to score high on this factor.

In the context of personality and personality expression online, this would speak for the rich-get-richer theory: While open people can expand their intellectual abilities, less open people might be overwhelmed by the great variety of information. Referring to the hypothesis of *knowledge-gap* (Tichenor, Donohue, & Olien, 1970) or the *aptitude-treatment interaction* (Cronbach & Snow, 1977), openness might moderate the influence of online information. However, there are no studies addressing this relationship so far.

- **Agreeableness.** Agreeableness reflects friendly and cooperative behavior. People with high scores seek for social harmony, whereas disagreeable individuals are suspicious and unkind. In a study by Landers and Lounsbury (2006) agreeableness was significantly negatively related to the total Internet usage.

Results on agreeable behavior online are inconsistent. While Mikami and colleagues (2010) found cross-situational consistency among young people regarding their social behavior online and offline, other scholars report increasing as well as decreasing tendencies of altruistic behavior online (Kiesler & Kraut, 1999; Swickert, Hittner, Harris, & Herring, 2002).

- **Conscientiousness.** Conscientious individuals are organized, show self-discipline and behave dutifully, whereas people with low scores on conscientiousness are careless and impulsive. So far, there has been little interest on conscientiousness on the Internet. Li et al. (2006) reported a negative relationship between conscientiousness and Internet addiction. Accordingly, Landers and Lounsbury (2006) point out that conscientiousness is negatively related to the total Internet usage.

Similar to openness, it seems reasonable that conscientious behavior on the Internet reflects an rich-get-richer-effect: People scoring high on conscientiousness might tend to benefit from the flow of information since they have distinctive skills in organizing and dealing with tasks, whereas people with lower scores on conscientiousness are rather running the risk of getting *lost in cyberspace* (cp. Colquitt, Hollenbeck, Ilgen, LePine, & Sheppard, 2002).

This short overview illustrates that investigations on the relationship between the five factor personality traits and computer-mediated communication have not led to coherent results yet. Especially concerning the frequency and intensity of usage, we must exactly differentiate between different online services and features. It is very unlikely that a single personality trait can predict the general intensity and frequency of Internet usage. Likewise, research on the expression of individual traits online hardly produced any clear results. Some studies supported the rich-get-richer-theory, whereas other studies exposed a poor-get-richer-effect.

Personality on the Internet

The studies presented above are based on different conceptual models. To some extent they refer to personality as an independent variable, sometimes to personality as a dependent variable. Additionally, some studies describe an interaction between personality and situational aspects. Hence, personality is both, the influential factor as well as the influenced element in the assumed cause-effect relationships. This differentiation does not only apply to research on the five factors, but also to trait-psychological Internet research in general.

Perspectives on Personality and Online Behavior

The great variety of trait-psychological research questions on online behavior can be best put in order by regarding the assumed causalities and effects. We can distinguish at least between four different model assumptions (see Figure 1):

1. Personality as the independent variable impacts online behavior: Personality has an influence on how people behave on the Internet. For instance, personality traits may influence the choice of online content, the intensity of use of certain online services or may lead to a general preference of online communication when compared to face-to-face communication.

Example: Extraverted people use Social Networking Sites more intensively than introverted people.

2. Moderating variables regulate the strength of influence of personality on online behavior: Compared to the first perspective, the impact of personality on online behavior is also affected by moderating variables. These variables determine how intensively personality expresses online. Moderating factors may include different online services, levels of anonymity, levels of intimacy or other aspects, which vary within the online environment. This approach takes into account that behavior is not only influenced by personality aspects but also by situational and contextual conditions (see section "Situational Impact").

Example: Extraverted people use Social Networking sites more intensively than introverted people when profiles are public.

3. Personality as the dependent variable is affected by independent variables: Qualities of the online environment lead to a change of personality. This approach assumes that, when compared to the offline personality, people change in a systematic manner online. Of course, a change of personality also leads to a change in behavior in a direct consequence. Therefore, this perspective refers to both, personality as the dependent variable and personality as the mediator between aspects of the online environment and online behavior. In Figure 1 this two-step flow is illustrated by the different coloring of the symbol for online behavior as an optional second-order effect.

Example: Online anonymity makes people become more extraverted (and, therefore, they also behave more extraverted).

4. Personality as the moderator variable regulates the strength of influence of independent variables on online behavior. This perspective assumes an influence of certain characteristics of the online environment on behavior. Personality regulates this relationship. That means, that the influence does not apply to all people equally. The influence varies depending on their personality structures.

Example: Anonymous settings lead to more outgoing behavior among introverted, but not among extraverted people.

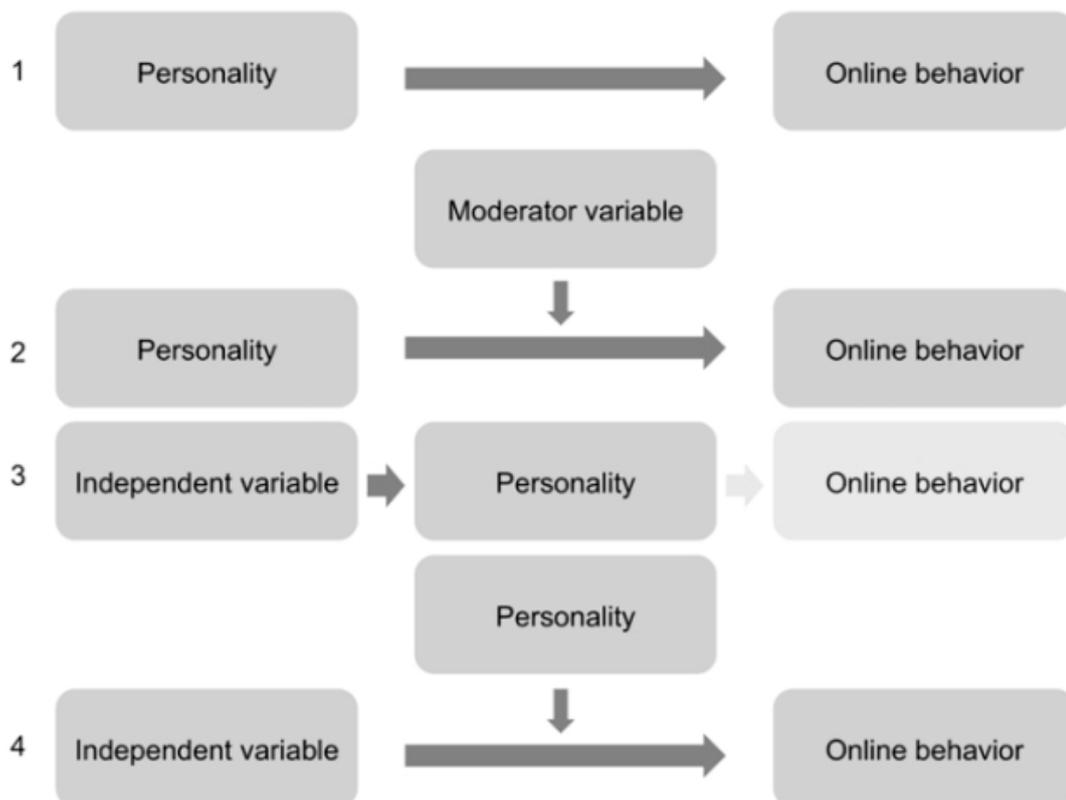


Figure 1: Four perspectives on the relationship between personality and online behavior

These four approaches can be found as more or less implicit assumptions in the research literature on personality and online behavior. Perspective 2 and perspective 4 are quite similar, since both approaches assume an interaction between personal und contextual aspects. They often just differ according to scholarly emphases and focal points. For the sake of completeness, a fifth approach, which enhances the idea of mutual interactions, should also be mentioned:

5. Processes of interaction between personality, online environment, and behavior. This approach, in a way,

integrates all the aforementioned perspectives. It points out, that the diverse points of view are not mutually exclusive, but taken individually, only consider a single part of a very complex system of interactions. The notion of interaction implies that variables affect each other (e.g. personality influences online behavior and vice versa) and also includes moderating effects. Empirically, this approach is of course the most difficult to implement and hard to find in recent research literature. So far, there are no theoretical models to represent the complex interplay between various personality characteristics of Internet users, the specific characteristics of the online environment, and online behavior accurately enough.

Example: Extraverted people use Social Networking Sites more frequently and intensively than introverted people. As a result, extraverted people are more socially involved and extraversion increases still more. On the other hand, introverted people are socially excluded and extraversion decreases.

Situational Impact

As we have seen, different ways of looking at the relationship between personality, dispositional factors of the online environment, and online behavior can be found in the research literature. These approaches are partially complementary, but also involve some contradictory aspects. For instance, the question remains, whether online communication tends to result in a different trait expression, or whether it actually leads to structural changes within personality. The theoretical concept of personality includes no situational variations. In fact, personality is just what remains constant in a person's behavior *across situations* (cp. Ryckman, 2008). Taking personality as a dependent variable, therefore, is contradictory to this concept.

The question, how situational and personal factors affect human behavior, did not just emerge in the course of research on computer-mediated communication. In fact, the question has a long legacy in the field of trait psychology. There had been lively discussions in the 1960s and 1970s about the proportionate influences of person and situation, known as the person-situation debate: When is personality more responsible for behavior and when is it up to situational conditions (Mischel, 1968)? In today's trait research, the debate has lost its controversy to a large extent (Matthews et al., 2003). Current trait psychology is characterized by an interactional approach. Interactionism takes into account that personality aspects, situational influences as well as interactions have to be analyzed in order to understand human behavior (Endler & Magnusson, 1976; Mischel & Shoda, 1995). According to the paradigm of cross-situational of personality, most authors today agree that personality-related behavior varies across different situations but is often stable within similar situations over time (Mischel & Shoda, 1995).

Although the interactional approach can be considered as state-of-the-art of today's trait psychology, no universal model for the interaction between personality, situation, and behavior has been established so far. Nevertheless, the differentiation between *weak and strong situations* (also: powerful situations) proposed by Mischel (1977) has met minimum consensus among trait psychologists. Hence, weak situations are poorly structured and widely free from social constraints or behavioral guidelines. Here, the personality of a person has the crucial influence on behavior. In strong situations personality has a relatively small effect. Here, the behavioral options are already significantly limited by the situation. This differentiation following, we would assign computer-mediated communication mostly to weak situations and, respectively, suggest that traits matter on the Internet: The Internet is mostly an informal place, where behavioral instructions are rare and widely voluntary (cp. Mischel, 1977). Especially in comparison to face-to-face communication, in which there is often strong social control, perceived anonymity and distance of the online environment offer a vast amount of individual leeway. Certainly, there are also strong situations in online communication. Applying for a job offer by e-mail has the same requirements as sending a cover letter by mail. Nevertheless, online communication and interaction are still not as formalized as most face-to-face interactions and, therefore, will unlikely lead to uniform behavior.

Research Questions

In this article, we want to contribute to the discussion and understanding of the complex system of relationships and interactions between personality and online communication. We act on the assumption that the issue of cross-situational consistency is fundamental for all trait-psychological investigations on online behavior. Given the predominance of the five factors in the research literature, we want to find out whether the five factors – exemplarily for the entire personality of a person – are expressed differently online and offline. As outlined above, we have seen that research on the online expression of five factors hardly produced any clear results. Some studies supported the rich-get-richer-theory, whereas other studies exposed a poor-get-richer-effect. In this study, therefore, we decided on a merely explorative design rather than testing distinctive hypotheses. Thus, we want to investigate the following question:

RQ 1: Are five factor personality traits expressed differently offline and online?

Since we do not assume a general change of personality online, the first research question primarily refers to the second of the presented models (see Figure 1): According to the cross-situational consistency, personality does not change on the Internet. Nevertheless, the expression of personality might vary on the Internet due to contextual influences. This is entirely consistent with the interactionist perspective of personality psychology (Endler & Magnusson, 1976) after which behavior emerges from interactions of person-specific and situation-specific determinants.

Next we want to examine whether a change between offline and online personality may depend upon the initial offline level. We have seen that there is evidence for both the rich-get-richer-effect, as well as for the poor-get-richer-effect (Amichai-Hamburger, Kaplan, & Dorpatcheon, 2008; Amichai-Hamburger, Wainapel, & Fox, 2002). Therefore, it seems reasonable that when it comes to systematic changes on the Internet, effects do not apply to all individuals equally.

Our second research question, therefore, differentiates between different personality levels offline.

RQ2: Does the change of trait expressions from offline to online vary between people with different trait levels?

Since gender has often been emphasized as an influencing factor when it comes to both Internet usage (Pew Internet and American Life Project, 2005; Weiser, 2000) and the manifestation of personality traits (Costa, Terracciano, & McCrae, 2001), gender effects will also be investigated and controlled.

RQ3: Do gender effects occur?

Method

Instruments

To answer these questions, both the expression of personality online and offline have to be identified to see if systematic variations appear. In trait-psychological research, the questionnaire is the predominant method to ascertain personal characteristics. Self-descriptions on the basis of questionnaires have many, especially research-economic advantages. However, since personality questionnaires concern private and intimate issues, they can certainly be criticized in particular with regard to problems of validity and social desirability. Nevertheless, there are many well-established personality questionnaires, which are extensively validated and standardized. For our purposes, the use of a questionnaire offers many advantages. It allows measuring personality of many participants in parallel. Moreover, this proceeding builds on numerous media-psychological studies in the past, which also reverted to personality questionnaires (see below).

To measure the offline personality, the German version of the NEO-Five Factor Inventory (NEO-FFI; Borkenau & Ostendorf, 1993; Costa & McCrae, 1992) was used. The NEO-FFI is the short version of the NEO-PI-R (Costa & McCrae, 1992). It includes a total of 60 statements (12 Items for each factor) to be rated on a five-point scale ranging from "strongly disagree" to "strongly agree". The NEO-FFI is one of the most common personality questionnaires and has been frequently employed in media-psychological investigations in the past (Amichai-Hamburger & Vinitzky, 2010; Ehrenberg, Juckes, White, & Walsh, 2008; Guadagno et al., 2008; Hardie & Tee, 2007; Hertel, Schroer, Batinic, & Naumann, 2008; McElroy, Hendrickson, Townsend, & Demarie, 2007; Ross et al., 2009; Swickert et al., 2002). Personality questionnaires, which specifically relate to personality online, do not exist yet. To measure the expression of the five factors online we reformulated the original NEO-FFI. In this new version, all items refer to computer-mediated communication and behavior on the Internet. To achieve that, all original NEO-FFI items have been rephrased with the addition „On the computer or Internet ...". For instance „On the computer or Internet, I really enjoy talking to other people" or "On the computer or Internet, I try to be friendly to everyone I meet." Three Items (two items of the subscale openness, one item of the subscale agreeableness) have not been able to transfer to computer-mediated communication and have been deleted for both versions. Both questionnaires, the original NEO-FFI and the "Internet-version", therefore, consider the same behavioral aspects, either offline or online. However, the original NEO-version is a general personality measure instrument, while the online NEO-version can be regarded as a situation specific personality measure instrument. Therefore, this approach allows us to compare the general personality expression and the expression online.

Our approach resembles the study of Stritzke, Nguyen, and Dirkin (2004). In this well received article, the expression of shyness on the Internet was investigated. General shyness was measured with a common shyness scale while shyness on the Internet was measured with the same items and the addition "online". It showed that both versions of the questionnaire led to significantly different outcomes. The authors conclude that shy people are less shy online.

Participants

For this survey, a young, media-affiliated sample was chosen. Thus, results are most likely to apply also to future generations of Internet users (see conclusion). A total of 122 undergrad students of communication studies (45.1% male, 54.9% female) of Berlin University of the Arts between 20 and 29 ($M = 22.9$, $SD = 2.47$) years of age took part in the investigation. Borkenau and Ostendorf (1993) reported correlations from 0.08 to 0.32 between ages of participants and their NEO-FFI values. Unfortunately, there is no detailed age-related normative data available for the German version of the NEO-FFI. However, the total sample ($N = 2112$), on which Borkenau and Ostendorf based their manual analysis of the questionnaire, was quite young with $M = 28.74$ years of age on average ($SD = 11.31$). Their sample, which also contained a large number of students, was composed of quartiles: 25% of the participants were each respectively between 16 and 22 years, 22 and 24, 25 and 31 years and, finally, older than 31. Hence, the reported means are quite comparable to the present sample. In Table 1 it is shown that there is a maximum difference of 0.15 between the two means of the trait conscientiousness. From these results, we conclude that there are no serious systematic deviations in this sample.

Table 1: Comparison of the means and standard deviations of the five factors according to Borkenau & Ostendorf (1993) and in the present sample

	Borkenau & Ostendorf		Blumer & Doering	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Neuroticism	1.84	0.70	1.75	0.58
Extraversion	2.36	0.57	2.48	0.47
Openness for Experience	2.71	0.52	2.79	0.53
Agreeableness	2.44	0.49	2.47	0.49
Conscientiousness	2.53	0.63	2.68	0.54

Procedure

To answer our research questions, repeated measures of the five factor personality traits were conducted in the years 2010/2011. In a first step, the five factors were measured with the original NEO-FFI. A few weeks (4 to 6 weeks) after the first data collection, the same participants completed the modified Internet-version of the NEO-FFI. The extended time span between the surveys was chosen to minimize problems of internal validity of repeated measures such as memory effects and reactivity. The data collection took place in the context of psychological courses. During the first assessment, the students were instructed according to the guidelines of the NEO-FFI manual to complete the questionnaire. During the second assessment, the same instruction was given and, it was further emphasized that all items of the questionnaire relate to communication and interaction on the Internet or on the computer.

Data analysis

The data analysis basically refers to the comparison of the outcome of the two NEO-versions. Since the same subjects have completed the NEO questionnaires at two time points, a repeated measures ANOVA was chosen to analyze the data. Compared to *t*-tests, this method is favored for reducing unsystematic variability in the design and requiring fewer participants. Additionally, the method provides greater power to detect effects by focusing on the within-participant variance rather than on between-group variance. To test RQ1 and RQ3, two-way repeated measures ANOVA were conducted using the NEO-version as the independent variable, the score as the dependent variable, and gender as the between-subjects factor. To detect differential effects depending on the trait level (RQ2), the sample was divided into equal-sized quartiles. Again, repeated measures ANOVAs were performed.

Table 2: Internal Consistency by Cronbach's Alpha

Internal Consistency	α Manual	α Regular	α Internet
Neuroticism	.85	.81	.80
Extraversion	.80	.73	.71
Openness	.71	.75	.67
Agreeableness	.71	.70	.69
Conscientiousness	.85	.83	.82
Average	.78	.76	.74

Results show that for the present study Cronbach's alpha lies on average below the α -values reported in the manual. This result is most likely due to the small sample size. The values for the Internet version again turn out to be a little bit lower, but still in an acceptable range.

Results

First, it was investigated whether the five factors increase or decrease in computer-mediated communication. Figure 2 shows the mean values for both NEO-versions for the five subscales.

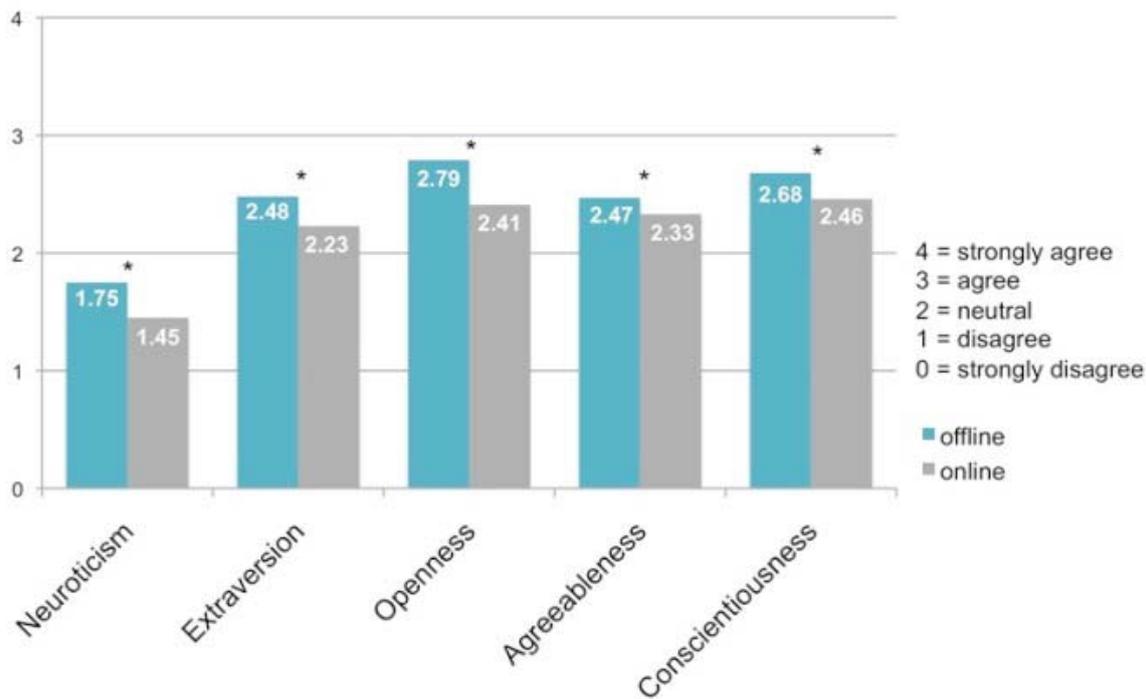


Figure 2: Means for both NEO-versions for the five subscales, *= significant differences

The means of the Internet-version constantly lie below the original version. To test whether the differences between both versions are statistically significant (RQ1) and whether gender has an influence (RQ3), a two-way Repeated Measures ANOVA was conducted. Results show that the NEO-scores are significantly influenced by the NEO-versions for all five subscales: neuroticism $F(1, 120) = 41.44, p < .001$ with a medium effect partial eta squared $\eta_p^2 = .26$; extraversion $F(1, 120) = 40.07, p < .001$ with a medium effect $\eta_p^2 = .25$; openness $F(1, 120) = 90.07, p < .001$ with a large effect $\eta_p^2 = .43$; agreeableness $F(1, 120) = 17.43, p < .001$ with a small effect $\eta_p^2 = .13$, and conscientiousness $F(1, 120) = 32.27, p < .001$ also with a small effect $\eta_p^2 = .21$. Thus, the two NEO-versions lead to significantly different responses. Additionally, no interaction effects between the within-subjects variables (NEO-versions) and the between-subjects factor (gender) were found. Nevertheless, very small main effects occurred for gender concerning neuroticism with $F(1, 120) = 7.67, p < .01, \eta_p^2 = .06$ and agreeableness with $F(1, 120) = 8.08, p < .01, \eta_p^2 = .06$. In both cases, female participants showed higher scores than male participants.

However, the question remains whether this result holds true for all user groups equally (RQ2). For example, previous studies on extraversion / introversion online suggest that the influence of computer-mediated communication does not apply to all individuals in the same way. For instance, as stated above, there are indications that people scoring low on extraversion might become more extraverted online (poor-get-richer), whereas others do not change. To test whether there is a differential effect of computer-mediated and online communication, our sample was divided into approximately equal-sized groups for each factor. Therefore, the scores of the original NEO-version were taken as a basis and participants were assigned to quartiles for each five factor component: 30 people with *very low* scores, 31 people with *low* scores, 31 people with *high* scores and 30 people with *very high* scores yields a total of 122 subjects. Figure 3 compares the means of the two NEO-versions for each quartile.

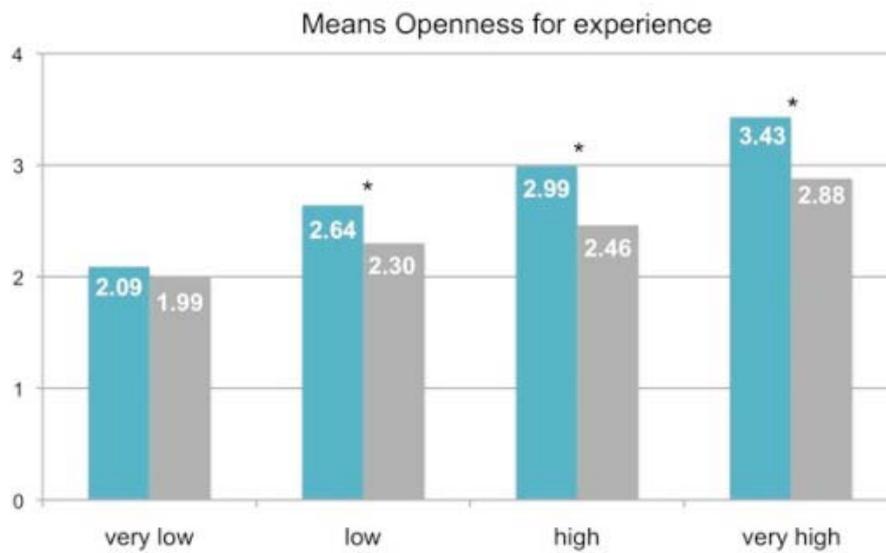
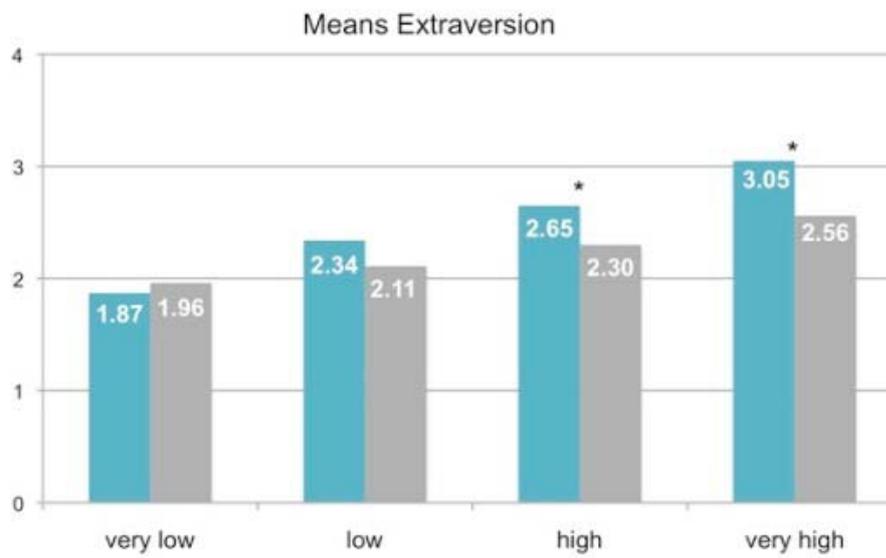
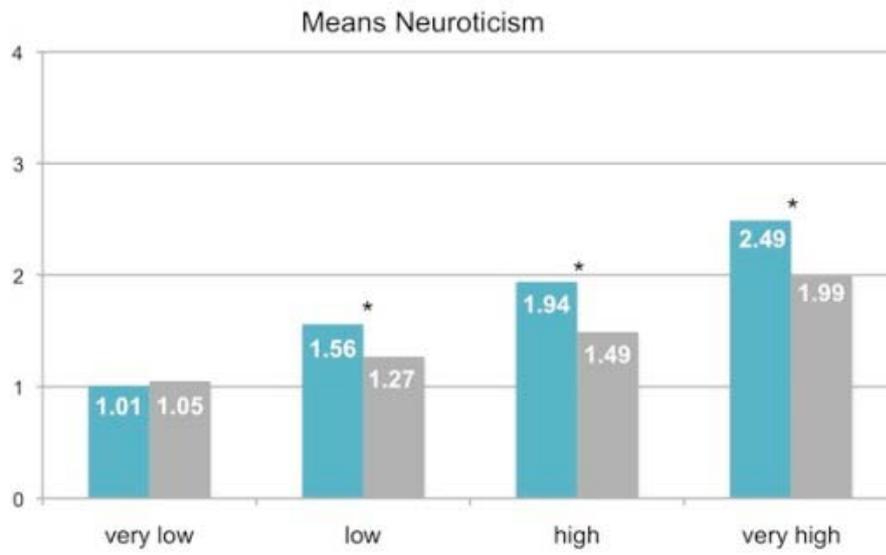


Figure 3: Means for quartiles very low, low, high and very high; * = significant differences after Bonferroni correction

It shows that a decrease of individual scores does not apply for all people in the same way. Nevertheless, we can observe the same effect for all five components: Accordingly to the overall effect, people assigned to the groups very high, high and low tend to score lower on the subscales of the NEO Internet-version. The lowest quartile, however, shows higher scores online in four of the five factors. Although we could not find a significant *increase* of any five factor component online (see Table 3 for p -values and effect sizes η^2_p of Repeated Measures ANOVA for all quartiles), it shows that computer-mediated and online communication have a differential influence on users depending on their initial offline personality.

Table 3: Repeated Measures ANOVA: probability values p and effects sizes partial eta squared η^2_p for all quartiles.
* = significant after Bonferroni correction

Quartile	Very low		Low		High		Very high	
	p	η^2_p	p	η^2_p	p	η^2_p	p	η^2_p
Neuroticism	.662		< .001*	.382	< .001*	.652	< .001*	.424
Extraversion	.154		.003	.254	< .001*	.405	< .001*	.656
Openness	.261		< .001*	.584	< .001*	.672	< .001*	.598
Agreeableness	.172		.340		.002*	.285	< .001*	.506
Conscientiousness	.110		.093		< .001*	.473	< .001*	.637

Also in the "low" group p -values for agreeableness and conscientiousness are no longer significant; all other values remain significant. Considering the exploratory approach, a Bonferroni correction was conducted to ensure that the cumulative Type I error is below .05 (α divided by number of comparisons: $.05/20 = .0025$). Even here, results are still significant for all previous significant cases except for the low extraversion group with $.003 > .0025$.

Looking at the single components, following results can be appointed: The score for neuroticism is significantly reduced among the groups very high, high and low in the Internet-version of the NEO-FFI. No mean difference was found for the group very low. Extraversion significantly decreased for the groups high and very high. After Bonferroni correction, the low group slightly became not significant. There are no differences in the very low group. Openness is significantly reduced in the groups very high, high and low, while the very low group again revealed no differences. For the components agreeableness and conscientiousness respectively the groups very high and high showed significant outcomes, whereas the low and very low groups produced no significant results.

Discussion

Looking at the means of the total sample, it is noticeable that the means of the Internet-version of the questionnaire constantly lie below the means of the original version. How can this be explained? Certainly, the simplest and most obvious explanation would be that the expression of personality is fundamentally weaker on the computer and the Internet. That is, all five factors express less intensively in individual behavior, emotion, and cognition on the computer or the Internet. This interpretation would conform to the study of Stritzke et al. (2009) who found a lower expression of shyness online with the same method. Besides this interpretation, the results can also be attributed to the modification of the questionnaire: Compared to the original version of the NEO-FFI, the items of the new version represent a specification of the situational context. Even if this does not automatically lead to a strong situation in terms of Mischel's (1977) conception, all items have been narrowed down to a specific context, which leads to a strengthening of the situational context. This specification of the items hinders individual interpretations of the contextual conditions. In this case the results are not due to the digital environment per se but to the specification of the situational context. Similar effects would occur, if the NEO-FFI items were supplemented with other more concrete aspects for instance "In the summer ..." instead of "On the computer or on the Internet ...". Most probably both aspects have led to the results of this study. Therefore, we would argue that in online behavior the influence of personality is reduced due to situational requirements and more similar interpretations of these contextual cues.

However, this interpretation does not hold true for all five factors. A small mean value does not automatically indicate a lower trait expression. Because of the bipolar conception of the NEO-FFI scales, a smaller influence of personality would result in a convergence to mid-scale ("neutral" = scale value of two). This applies, however, only to four of the five factors. The mean of the scale of neuroticism already lies below the average value of two in the original version. In the online version the mean is even lower. A convergence to the mid-scale does not occur in this case.

When looking at the means of the quartiles individually, these tendencies are even getting clearer. With regard to the traits of extraversion, openness, agreeableness, and conscientiousness the mean values of the online version lean towards mid-scale in almost all quartiles. This even holds true for the quartiles "very low", where the means already lie below two. Here, the means of the online version tend to be slightly higher. However, the differences between the

means of the two versions do not prove to be significant in these quartiles. In contrast, the means of the scale of neuroticism again show another pattern. For neuroticism, means of the online version do not tend towards mid-scale but towards one extreme. The participants of the present study report being emotionally more stable on the computer and the Internet. Especially people who score very high on the original neuroticism scale benefit from the digital environment and even reach a mean below the average value of two ($M = 1.99$). Also the means of the quartiles high and low are significant lower in the online version. Only the quartile very low – which contains individuals who can be described as emotionally very stable – the mean of the online version is slightly higher than the mean of the offline version. This change, however, turns out to be not significant.

To sum up, we conclude that for four of the five factors the data indicates a decrease of personality expression online, which is most probably due to the specification of the situational context. With regard to the trait of neuroticism, however, an additional effect occurs: The emotional stability increases on the computer and the Internet. This trend is likely, as has been described in previous studies, due to the typical features of computer-mediated communication (see Rice & Markey, 2009).

Outlook & Limitations

Previous media-psychological research has addressed the question of potential changes of personality expression during the use of digital technologies only fragmentarily. On the one hand, existing correlative research on personality traits and computer or Internet usage implies a cross-situational consistency of behavior and / or personality while other studies describe changes in behavior and / or personality in computer-mediated communication. In the present study, the five factor personality traits have been measured with the original version of the NEO-FFI and with a modified Internet-version in which all items refer to computer-related behavior, emotion, and cognition. Relating to the whole sample the means of the Internet-version of all five subscales constantly lie below the original version. With regard to the traits of extraversion, openness to experience, agreeableness, and conscientiousness the means converge toward the midscale. In other words, the modified Internet-version leads to significantly lower self-reported trait expression on these four subscales. This is particularly surprising for the trait of extraversion, since many authors postulated that the anonymity of computer-mediated communication may lead to more out-going behavior (see above). We assume that the decrease of personality expression can be attributed to the specification of the situational context. Unfortunately, we cannot prove on the basis of our data that this reduction is specific to computer-mediated communication. Similar effects might occur if other specifications of the situational context were added to the items. To clarify the question of the situational influence, we would recommend designing further studies in consideration of the Latent-State-Trait theory (Steyer, Schmitt, & Eid, 1999). Here, it would be possible to determine the ratio of personal and situational influences on behavior. This would also allow testing whether the situational influence within one NEO-version is larger than within the other. With regard to the trait of neuroticism, however, the means do not converge toward mid-scale but to one extreme of the scale. Here, the expression of personality seems to be higher on the computer and the Internet. That is, people report higher emotional stability in the digital environment of the computer and the Internet. This result indicates a positive influence of computer-mediated communication especially on people, who show high levels of neuroticism.

Some limitations to the interpretation of the presented study have to be addressed. Our sample consisted exclusively of young, media- and Internet-affiliated students. Thus, results just apply to this limited group of users. We deliberately decided on these individuals since we assume that individuals, who have grown up with digital technologies, represent future generations. During the last years various authors have repeatedly pointed out that the distinction between online and offline worlds is obsolete in particular for these user groups (e.g. Castells, 2001; White & Le Cornue, 2011). This perspective takes into account that the usage of the Internet and other digital technologies has become an integral part of our lives. The Internet resembles no longer a parallel world, but an extension to the real world (Kennedy, 2006). In contrast to a young and media-affiliated group of Internet users, people who encountered the Internet rather tardily in their lives might show a different relationship to the Internet and computer-mediated communication. A comparative study between these two user groups would certainly be an interesting possibility. Nevertheless, our results clearly show that there are at least differential influences of the digital environment on different personality traits. In the context of the discussion about the blurring boundaries between the online and offline worlds, it is interesting that we could still find systematic differences between online and offline communication. From a psychological point of view, therefore, we could not witness an indifference between online and offline worlds.

Our approach of measuring contextual expression of personality with a modified personality scale bears some difficulties concerning the interpretation of the results, which mainly address internal and ecological validity. The Internet-version of the NEO-FFI might have a lower internal validity than the original version because both versions were provided as a paper-and-pencil-test. Ecological validity of the Internet-version can probably be enhanced when the new version of the questionnaire is conducted computer-based. Alternatively, some kind of digital priming, e.g. a computer-based chat episode or an online game environment before completing the questionnaire, would be helpful to enhance validity as well. For future investigations it might reasonable to have half of the subjects answer the online questionnaire and half of the subjects answer the offline questionnaire and to reverse this process at a second point of time. This would minimize the danger of just measuring effects of repeated measures.

Furthermore, we cannot rule out that the specification of the items might have led to some confusion among the participants. Some items might look awkward to the participants when they just relate to the computer and the Internet. The convergence towards the mid-scale among four of the five factors might be a result of this confusion. People might rather give a more neutral answer, when they are not sure about the meaning of the item. For further investigation, inventories that are not so specific should better be used for this purpose (e.g. Big Five Mini-Markers;

Saucier, 1994). Furthermore, we cannot rule out that adding additional words to the NEO-FFI items changes the inventory and its factor structure substantially. Thus, in further investigations the factor structure of both versions should be analyzed and compared. Due to the small sample size, this was not possible with our data.

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