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Show me your friends and I will tell you what type of person you are: How one's profile, number of friends, and type of friends influence impression formation on social network sites

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This experiment examines how far extraversion of the target (self-generated information), extraversion of the target's friends *(friends-generated information), and number of* friends *(system-generated information) influence the perceived popularity, communal orientation, and social attractiveness of the target. The warranting principle states that judgments rely more heavily on other-generated than self-generated information because the former is more immune to manipulation. It is argued that the warranting principle becomes more important when more interpersonal traits have to be judged. In line with the expectations, other-generated information had only weak impact on the popularity judgments. With regard to communal orientation, other-generated information had stronger effects and qualified the effects of self-generated information. Only other-generated information had an impact on perceived social attraction.*

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Impression formation online has been studied since the first days of the internet. The earliest researchers doubted that reliable impressions could be formed in anonymous or pseudonymous text-based computer-mediated communication such as chats, newsgroups, or multi-user-dungeons (MUDs; Dubrovsky, Kiesler, & Sethna, 1991; Kiesler & McGuire, 1984; Sproull & Kiesler, 1986). However, Walther (1992) soon developed a model that described how people can compensate for the lack of nonverbal cues and form impressions of their interaction partners. Nowadays, many online venues are no longer anonymous. Users have profiles with their pictures and detailed descriptions of themselves that can be used as basis for impression formation. Next to this self-generated information, social network sites (SNS) provide two additional sources of other-generated information; information generated by a

target's *friends*[1] and system-generated information such as number of *friends* (Tong, Van Der Heide, Langwell, & Walther, 2008). The goal of the present paper is to examine how these three sources of information jointly influence the impressions that are formed by viewing a SNS profile, more specifically, a profile on the Dutch SNS Hyves. It is argued that how these cues are combined depends on the characteristic that has to be judged.

SNS

SNS are "web-based services that allow individuals to (1) construct a public or semi-public profile within a bounded system, (2) articulate a list of other users with whom they share a connection, and (3) view and traverse their list of connections and those made by others within the system" (boyd & Ellison, 2007). Hyves is the largest Dutch SNS, and has been ranked as number 15 worldwide (Arrington, 2009). Launched in October 2004, it has more than eight million registered users, according to its own statistics, which are displayed on the main page, www.hyves.nl. Hyves is a leisure-oriented SNS, comparable to Facebook and MySpace. In the beginning, it was mainly used by students and school pupils. Currently the average age of the users is 27, indicating that it is now also used by older people.

SNS are a means for self-presentation and for building and maintaining contact with friends and acquaintances (boyd & Ellison, 2007; Donath & boyd, 2004; Ellison, Steinfield, & Lampe, 2007). The users have profiles, which usually include a photograph of themselves and information about their age, hobbies, and favorite music and books. Hyves also offers a weblog, and photo- and video-sharing features.

In contrast to other virtual communities, SNS users can add *friends* to their profile by sending a request for friendship to another user. When the other party accepts, the relationship is displayed in the network of *friends*. *Friend* is not always used in the traditional sense on SNS, some people connect to celebrities and bands they do not know personally, or to people they simply find cool (boyd, 2006). These *friends* can leave comments on the profile of a user, thereby also providing information about the user (Walther, Van Der Heide, Kim, Westerman, & Tong, 2008).

Impression formation online

Impression formation and management is a central process in interpersonal interactions (Berger & Calabrese, 1975; Goffman, 1959). People usually try to present themselves in a positive manner. This is often easier in online environments than in face-to-face communication. For example, Walther (1996) proposed in his hyperpersonal model that the asynchronicity and anonymity of many online environments allows people to construct idealized self-presentations. That people indeed carefully construct their self-presentation online has, for example, been shown in the context of online dating sites (Ellison, Heino, & Gibbs, 2006).

Whereas it is quite easy to make up fake profiles in chats or web forums (see for example Bruckman, 1993, on gender swapping), this is more complicated in a SNS because it is the norm to have *friends* on these sites. If these *friends* are indeed friends, or at least people who know the profile owner in real life, they might express doubts on the validity of some information on the profile. While information on the user's own profile is a conventional signal and thus easy to fake, *friends* provide a social context that can confirm the self-presentation of the profile owner (Donath, 2007).

When analyzing impression formation, the Brunswik lens model (Brunswik, 1956; Gigerenzer & Kurz, 2001) is often used as a framework. This model states that the behavior of individuals and the artifacts produced by them reflect their personality. These environmental cues are used as a lens by observers who try to make inferences about the personality of an individual. Cues can vary in their utility. The utility of a cue is determined by cue validity, cue utilization, and functional achievement. The validity of a cue is high if the cue accurately reflects the personality of the target. Observers do not use all available cues, but focus on some cues. Actual use of a cue is called cue utilization in the model. If an observer indeed uses valid cues, functional achievement is reached. The model has been useful in explaining impression formation in various situations, e.g., when people draw inferences from the target's bedroom (Gosling, Ko, Mannarelli, & Morris, 2002), websites (Vazire & Gosling, 2004) or music preferences (Rentfrow & Gosling, 2006).

Gosling, Gaddis, and Vazire (2007) studied the accuracy of personality impressions based on Facebook profiles and found that the impressions showed some accuracy. However, this study did not examine which parts of a Facebook profile were used as cues to infer these impressions.

As described above, profiles on SNS contain several sources of cues; self, *friends*, and system (Tong et al., 2008). The question is how people combine these various sources when forming an impression. The simplest way would be an additive combination of various cues as proposed by Anderson (1962). There is also evidence for simple averaging models (Anderson, 1965, 1968). Other models argue that negative information, especially in the domain of morality judgments, receives a higher weight (De Bruin & Van Lange, 1999; Reeder & Coovert, 1986; Skowronski & Carlston, 1987, 1989). Morality and competence, often also called communion and agency, are the two central dimensions in impression formation (Abele, Cuddy, Judd, & Yzerbyt, 2008; Fiske, Cuddy, & Glick, 2007). Communal traits are traits such as friendly, honest, reliable and unselfish, whereas agentic traits are traits such as competent, assertive, and ambitious. Communal traits are mainly other-profitable, whereas competence or agentic traits are self-profitable (Abele & Wojciszke, 2007; Peeters, 1992; Wojciszke, 2005; Wojciszke, Bazinska, & Jaworski, 1998). Negative information about the communal orientation of an interaction partner is more important because it signals that this person would be better avoided as interaction partner.

Walther and Parks (2002) differentiated information not according to its valence (positive or negative) or content (communal vs. agentic), but according to its source and its warranting value. The more immune information is to manipulation,

the higher the warranting value of the information. Other generated information should therefore be of higher warranting value than self-generated information. Consequently, it is expected to have a higher impact on impression formation. In terms of the lens model, a more valid cue should have a higher chance of being utilized, resulting in higher functional achievement.

Prior studies on information formation in SNS either did not compare different types of cues or report mixed results. Although Tong et al. (2008) introduced the distinction of self, *friends*, and system as sources of information, they focused exclusively on the influence of number of *friends,* a system-generated variable, on social attractiveness, extraversion, and physical attractiveness. There were non-linear relationships between number of *friends* and the dependent variables of social attractiveness and extraversion. An increase in number of *friends* resulted at first in a more positive evaluation, but too many *friends* resulted in less favorable evaluations. Physical attractiveness was unaffected by number of *friends*.

Walther et al. (2008) focused on the effect of other-generated information and examined how appearance and behavior of the *friends* of the target person influenced impression formation. The *friends* were either attractive or not very attractive; and they left either negative or positive messages about the behavior of the target on the ''wall'' of the target. Both types of information influenced impressions on some or all dependent measures. More attractive *friends* led to higher attractiveness and social attractiveness judgments of the target person, but did not influence task attractiveness and various aspects of credibility. Positive statements of *friends* resulted in higher credibility, task attractiveness, and social attractiveness. This pattern makes sense and indicates that people deliberately use different cues to form different judgments. Based on the similarity-attraction hypothesis, it makes sense to assume that attractiveness of *friends* is related to the target's physical and social attractiveness (Byrne, 1969; Morry, 2005; Selfhout, Denissen, Branje, & Meeus, 2009). However, physical attractiveness is a less valid cue for the task attractiveness of a person. Competence is a more valid cue to determine the task attractiveness of a person. The messages written by the *friends*, on the other hand, clearly described positive or negative behavior of the target; this information is a better cue to predict task attractiveness and credibility than physical attractiveness of these *friends*. Although this study claims to support the warranting principle, it mainly shows that other-generated information has a noticeable effect. The target's profile has not been manipulated, making it impossible to examine whether other-generated information has a stronger impact on impressions than self-generated information.

Another study by Walther, Van Der Heide, Hamel, and Shulman (2009) tested the warranting theory by comparing the influence of self- and other-generated statements. Experiment 1 used extraversion as dependent variable, experiment 2 used physical attractiveness as dependent variable. The results showed a clear warranting effect when physical attractiveness had to be judged, but were more equivocal when it came to extraversion. Although the contrast corresponding to the warranting hypothesis was significant, there were also significant negativity and additivity effects.

Additivity had the strongest effect. Walther et al. (2009) tested their hypotheses by a series of a priori contrasts, but did not report the results of a 2x2 ANOVA which makes it impossible to detect unpredicted effects. It seems that there is also a main effect of self-generated statements when extraversion is the dependent variable; and that this main effect is stronger than the effect of other-generated information.

In the literature reviewed above, only one paper directly compared the influence of self-generated and other-generated statements (Walther et al., 2009), and the results show only a clear warranting effect in the case of physical attractiveness, but indicate that there are also other processes at play in the case of extraversion. The type of dependent measure seems to moderate the way cues are combined in impression formation. Physical attractiveness is a highly desirable characteristic and the mass media promotes a norm of being attractive (Henderson-King, Henderson-King, & Hoffmann, 2001; Silverstein, Perdue, Peterson, & Kelly, 1986). It is also well known that people tend to exaggerate their physical attractiveness, especially in dating contexts (Cornwell & Lundgren, 2001; Toma, Hancock, & Ellison, 2008). Moreover, computer-mediated communication allows people to present themselves selectively and to choose a favorable profile picture (Toma et al., 2008; Walther, 1996). Thus, self-generated statements about one's own physical attractiveness are not very reliable and the strong warranting effect in this domain is not surprising. Indeed, additional analyses showed that claims of high attractiveness by a profile owner were perceived as less honest than claims of low attractiveness (Walther et al., 2009).

Although extraversion is a desirable trait, the mass media does not promote a strong norm of being extraverted. Consequently, there is less pressure to present oneself as very extraverted, and self-generated statements might therefore be more believable than in the case of physical attractiveness. Thus, it depends on the social desirability of the characteristic that has to be judged how self- and other-generated information is combined in impression formation.

The present research

The present paper builds on these findings and proposes another moderator of the warranting principle. The central argument is that other-generated information is more important when traits related to interpersonal behavior have to be judged (e.g., communal orientation). Interpersonal orientations can only be experienced in social interactions; the interaction partners are therefore a more valid source of information. Moreover, this paper extends prior research by examining the relative impact of all three types of information: self-, *friends*-, and system-generated information. It will take a slightly different approach to the impact of *friends*-generated information by not focusing on *friends*-generated statements, but on the appearance of the *friends* on their profile pictures. Walther et al. (2008) have found effects of the physical attractiveness of *friends*; the present research will examine whether these findings can also be extended to the domain of extraversion. Statements made by *friends*, at least those used in prior research (Walther et al., 2009; Walther et al., 2008), deliver

direct information about the behavior of the target; it is therefore not so surprising that they have a large impact on impression formation. The profile pictures of *friends* give more subtle cues. According to the similarity-attraction hypotheses, people are attracted by similar others (Burleson & Denton, 1992; Byrne, 1969; Morry, 2005; Selfhout et al., 2009). McPherson, Smith-Lovin, and Cook (2001) have shown that similarity characterizes many social networks, not only friendship networks. Donath (2007) argued that the *friends* on a SNS provide a context, and that, for example, an aggressive, rebellious profile becomes more credible if the *friends*' profiles are similar. However, this has not been tested in SNS so far. The present research aims to fill this gap. As in the first experiment of Walther et al. (2009), the effects of different extraversion cues will be studied. However, instead of focusing on the effects of extraversion cues on extraversion directly (which is more a sort of manipulation check), it examines the differential impact of these cues on popularity, communal orientation, and social attraction. These three variables are all somewhat related to extraversion and sociability, but they differ in their degree of interpersonal orientation. The main argument is that the cues are of different validity depending on the characteristic that has to be judged and that SNS users combine the cues provided in different ways.

Extraversion has been chosen as the manipulated personality characteristic to build on the work of Walther et al. (2009), but also for practical reasons. First, extraversion is a central variable. Next to openness to experience, conscientiousness, agreeableness, and neuroticism it is one of the so-called Big Five personality dimensions. The Big Five received wide empirical support and turned out to be a central framework for the study of personality (for reviews see John & Srivastava, 1999; McCrae & Costa, 1999). Extraversion is not only one of the most prominent personality dimensions, but also the one that is most accurately extracted from SNS profiles (Gosling et al., 2007). Moreover, prior studies have examined how extraverted people present themselves online and thereby provide information on how to manipulate extraversion in a profile. For example, Marcus, Machilek, and Schütz (2006) found that extraverted people put more information on their personal homepages than introverted people. Krämer and Winter (2008) found that extraverted people used more unconventional pictures on their SNS profile than introverted people did.

Popularity has been chosen as the first dependent variable because it is closely linked to extraversion. Being popular is an important concern, especially of adolescents because peer groups replace the influence of the parents at this time (Zywica & Danowski, 2008). Popularity has been defined in various ways (Zywica & Danowski, 2008). In the current study, popular individuals are defined as widely liked, entertaining individuals. This definition is close to Walther et al.'s (2009) operationalization of extraversion. The self- and other-generated statements in their study referred mainly to going out and partying. Therefore, a link between extraversion cues and perceived popularity is expected. In line with the findings of Walther et al. (2009) on extraversion, it is assumed that the three cues are combined in an additive way

when the popularity of the target has to be judged. That is, only main effects of the three types of information are expected.

Although extraversion is a positively evaluated characteristic, there are no strong norms about presenting oneself as extraverted. Therefore, the self-generated information on the profile can be regarded as credible (Gosling et al., 2007). Moreover, Zywica and Danowski (2008) found that highly extraverted persons were more popular on Facebook and also offline. Extraversion is therefore also a valid cue for popularity. Based on this argumentation, the first hypothesis is:

H1: The owner of an extraverted profile will be perceived as more popular than the owner of an introverted profile.

The system-generated number of *friends* is also expected to influence popularity ratings. Tong et al. (2008) report an increase in extraversion when the number of friends increased from 102 to 502; above that number, extraversion ratings showed a non-significant small decrease. Zywica and Danowski (2008) found that individuals with many Facebook friends are perceived as more popular. In the present research, only moderate and medium numbers of *friends* will be used. Thus, the second hypothesis is:

H2: A profile owner with many friends will be judged as more popular than a profile owner with few friends.

The profile pictures of the *friends* are also expected to influence the popularity ratings. In the domain of physical attractiveness, assimilation effects of physical attractiveness of friends to physical attractiveness of the target have been found (Walther et al., 2008). Because people expect birds of a feather to flock together, a similar assimilation effect is also predicted in the domain of extraversion.

H3: A profile owner with extraverted friends will be judged as more popular than a profile owner with introverted friends.

Communal orientation has been chosen as second dependent variable. As said above, communal orientation and agentic orientation are the two central dimensions in impression formation (Abele, Cuddy, Judd, & Yzerbyt, 2008; Fiske, Cuddy, & Glick, 2007). Communal traits are other-profitable traits; therefore, perceivers usually focus more on communal than on agentic traits when forming impressions (Wojciske et al., 1998). Other-profitable traits such as honesty or reliability can best be judged by interaction partners; they emerge from their interaction with the target. Thus, a stronger effect of other-generated information could be expected when communal orientation has to be judged than when extraversion has to be judged.

There are two types of other-generated information: system- or *friends*-generated information. A higher number of friends might be a good indicator in real life when friends are friends in the stricter sense of the word, indicating an intimate relationship. However, on SNS, individuals usually have at least fifty, and even hundreds of *friends*.

As boyd (2006) stated, a SNS *friend* is not necessarily a good friend and often not even a friend at all. Therefore, number of *friends* is not expected to influence the judgments of communal orientation.

The profile pictures of the *friends* provide more information about the communal orientation of the target. Extraversion is often perceived as related to sociability, although this link is mainly caused by the higher sensitivity to rewards of extraverts (Lucas, Diener, Grob, Suh, & Shao, 2000). Extraverts are also perceived as more credible (McCroskey, Hamilton, & Weiner, 1974). The pictures of outgoing, extraverted individuals are more likely to prime concepts of smooth, satisfying and honest interactions than pictures of withdrawn introverted people.

H4: A profile owner with extraverted friends will be judged as higher in communal orientation than a profile owner with introverted friends.

However, introverted individuals can also form close friendships, especially on the internet. Peter, Valkenburg, and Schouten (2005) found in a study on online friendship formation that extraverts and introverts formed online friendships via different processes. Introverted individuals preferred to communicate online to compensate for their lack of nonverbal skills. Burleson and Denton (1992) argued that it is mainly similarity in social-cognitive and communication skills that predicts attraction and satisfaction in relationships. Couples in which both partners had low levels of social skills were not less satisfied than couples in which both partners had high skills. Introversion-extraversion also determines how people approach and communicate with others; the fit between target's extraversion and *friends*' profiles extraversion should therefore be the important variable. The relationships of extraverted targets with extraverted individuals and the relationships of introverted targets with introverted individuals might be perceived as more intimate and satisfying friendships than the relationships between the dissimilar individuals. The perceived fit might then be attributed to a higher communal orientation of the target. Consequently, targets with similar *friends* might receive higher ratings on communal orientation.

H5: Extraversion of target's profile interacts with extraversion of the *friends*' profiles. Extraverted targets with extraverted *friends* will be judged as scoring higher on communal orientation than extraverted targets with introverted *friends*; introverted targets with introverted *friends* will be judged as scoring higher on communal orientation than introverted targets with extraverted *friends*.

Social attractiveness has been chosen as third dependent variable. Social attractiveness is the attractiveness of an individual as a friend (McCroskey & McCain, 1972). McCroskey and McCain (1972) distinguish it from physical attractiveness and task attractiveness. Physical attractiveness describes how good-looking and handsome somebody is, and task attractiveness refers to the attractiveness of somebody as work partner. Task attractiveness is therefore more closely related to agency, whereas social attractiveness is more closely related to communion. In contrast to communal

orientation, social attractiveness is a more behavioral measure; it assesses how far individuals would like to become friends with the target or whether they would like to spend some time with the target person. A reliable and trustworthy individual is more attractive as a friend, but being judged as reliable and trustworthy might not be sufficient to be chosen as a friend. Other variables such as perceived similarity (Byrne, 1969) play also a role. An individual who already has several close friends will also be less inclined to make new friends. Thus, weaker effects of the cues provided in a SNS profile are expected on social attractiveness. However, because social attractiveness of a target should be based stronger on the communal orientation of the target than on the target's popularity, a stronger effect of other-generated information is expected.

Prior research provided evidence for effects of other-generated information on social attraction. Tong et al. (2008) found an inverted u-shape relationship between number of *friends* and social attractiveness. Social attractiveness increased from 102 to 302 *friends* and then dropped again. A target with a moderate number of *friends* is thus perceived as more socially attractive. This leads to the following hypothesis:

H6: A profile owner with many friends will be judged as more socially attractive than a profile owner with few friends.

Walther et al. (2008) found that attractive profile pictures of *friends* increased perceived social attractiveness. Similar assimilation effects are expected for extraversion of the *friends* because extraversion is also evaluated positively.

H7: A profile owner with extraverted *friends* will be perceived as more socially attractive than a profile owner with introverted *friends*.

Method

Participants and design

The experiment had a 2 (target's profile: extravert vs. introvert) × 2 (number of *friends*: few vs. many) × 2 (profile-picture of *friends*: extravert vs. introvert)—between subjects design. A total of 124 (50 males and 74 females) Hyves users participated in the experiment. The mean age was 22 ($SD = 5.82$). Participants had been members of Hyves on average for a little bit more than two years ($M = 25$ months, $SD = 14$) and 47% logged in at least daily. On average, they had $M = 177$ *friends* ($SD = 131$, median = 147).

Procedure

Some participants completed the online experiment in the laboratory, whereas others received a link to it via email or Hyves. The experiment started with some questions on use of Hyves and self presentation on Hyves that were not relevant to the present paper. Participants then viewed the mock profile of the target person, Anouk. After viewing the profile, they rated their impressions of Anouk.

Independent variables

Extraversion of the target's profile. In the extraverted profile condition, the profile picture was a photoshopped picture showing two images of Anouk with different but lively facial expressions (see Appendix 1). In the introverted condition, the profile picture shows Anouk in the middle distance, sitting alone on the edge of a river (see Appendix 2). In the extraverted profile condition, the profile text was longer than in the introverted condition. Krämer and Winter (2008) found that extraverted individuals use non-standard profile pictures more often, and Marcus et al. (2006) found that extraverted individuals use more words on their homepages.

Number of friends. In the condition with few friends, Anouk had 82 friends; in the condition with many friends, Anouk had 382 friends. Tong et al. (2008) reported higher extraversion for 502 *friends* than for 102 *friends*, and keeping in mind that the average number of *friends* on Hyves is somewhat lower than on Facebook, a similar trend is expected.

Extraversion of the profile pictures of friends. On Hyves, the pictures of the nine *friends* who have logged in most recently are displayed prominently in the right corner of the profile (see Appendices). To manipulate extraversion of the *friends* while holding constant other factors, the pictures of the same nine people were displayed as *friends* in both conditions. Two pictures were used of each person. In the extraverted condition, each the *friends* made an outgoing impression, the pictures were often taken in a party context. In the introverted condition, the *friends* were always depicted alone and in a quiet way, e.g., reading a book. These pictures were evaluated by a different group of respondents. These respondents judged the pictures on two semantic differentials (introvert vs. extravert; quiet vs. exuberant). The scores were averaged, and the analysis showed that the nine extraverted pictures were indeed perceived as more extraverted ($M = 5.19$, $SD = 0.44$) than the nine introverted pictures ($M = 3.56$, $SD = 0.42$), $F(1,16) = 93.44$, $p < .01$.

Manipulation checks

There were manipulation checks for extraversion of Anouk's profile and number of *friends*. The manipulation check for extraversion of Anouk's profile consisted of three statements such as "Anouk is extravert" ($\alpha = .84$). The manipulation check for number of *friends* consisted of the item "Anouk has many friends".

Dependent measures

Popularity. Respondents gave their impression of Anouk on eleven semantic differentials (using 5-point scales). Five items that described Anouk on contrasts such as unpopular-popular or unsocial-social formed the scale popularity ($\alpha = .84$).

Communal orientation. Communal orientation consisted of six items such as unfriendly-friendly or dishonest-honest ($\alpha = .77$).

Table 1 Means, standard deviations and intercorrelations of the measures

	M	*SD*	1	2	3
1. Extraversion (manipulation check)	3.22	.88			
2. Popularity	3.45	.62	.65**		
3. Communal orientation	3.46	.44	−.22*	.18*	
4. Social attractiveness	3.06	.74	.03	.24*	.43**

Note: $^{*}p < .05$, $^{**}p < .01$

Social attractiveness. Two items similar to the scale by McCroskey and McCain (1972) measured social attractiveness. Respondents indicated on a 5-point scale how far they agreed with the statements "Anouk could be a friend of mine" and "I think it would be nice to spend some time with Anouk" ($\alpha = .71$). The means, standard deviations and intercorrelations of all measures are presented in Table 1.

Results

Manipulation checks. A 2 (target's profile) × 2 (number of *friends*) × 2 (profile pictures of *friends*) analysis of variance with the extraversion manipulation check as dependent measure revealed only a main effect of target's profile, $F(1,116) = 152.68$, $p < .001$, $\eta^2 = .57$. The profile of Anouk was perceived as more extraverted in the extraverted profile condition ($M = 3.84$, $SD = 0.64$) than in the introverted profile condition ($M = 2.52$, $SD = 0.53$).

A 2 (target's profile) × 2 (number of *friends*) × 2 (profile pictures of *friends*) analysis of variance with the number of friends manipulation check as dependent measure revealed a main effect of number of *friends*, $F(1,116) = 8.86$, $p < .01$, $\eta^2 = .07$. Respondents agreed more with the statement "Anouk has many friends" when she had 382 *friends* ($M = 3.33$, $SD = 0.97$) than in the introverted profile condition ($M = 2.83$, $SD = 0.91$). There was also a main effect of target's profile, $F(1,116) = 4.41$, $p < .05$, $\eta^2 = .04$. If Anouk had an extraverted profile, respondents agreed more with the statement that she had many friends ($M = 3.26$, $SD = 1.07$) than if she had an introverted profile ($M = 2.90$, $SD = 0.80$).

Hypotheses testing. The first three hypotheses addressed the use of the cues to judge the popularity of the target. Main effects were predicted. A 2 (target's profile) × 2 (number of *friends*) × 2 (profile pictures of *friends*) analysis of variance with popularity as dependent measure revealed a strong main effect of target's profile, $F(1,116) = 86.38$, $p < .001$, $\eta^2 = .43$. In line with H1, Anouk was judged as more popular when she had an extraverted profile ($M = 3.81$, $SD = 0.45$) than when she had an introverted profile ($M = 3.01$, $SD = 0.52$). There were also marginally significant main effects of number of *friends*, $F(1,116) = 3.67$, $p < .06$, $\eta^2 = .03$, and profile picture of *friends*, $F(1,116) = 2.91$, $p < .10$, $\eta^2 = .03$. As predicted by H2 and H3, Anouk was perceived as more popular when she had 382 *friends*

($M = 3.49$, $SD = 0.63$) than when she had 82 *friends* ($M = 3.33$, $SD = 0.61$). She was also perceived as more popular when these *friends* had extraverted profile pictures ($M = 3.49$, $SD = 0.61$) than when her *friends* had introverted profile pictures ($M = 3.34$, $SD = 0.63$). In line with the assumption that the three types of information are combined additively, no interaction effects were significant, all Fs < 1.12, *ns*. Moreover, self-generated information had the strongest impact.

For communal orientation, a higher impact of other-generated information was expected. H4 predicted that targets with extraverted *friends* would be perceived as higher in communal orientation, and H5 predicted that this effect would be qualified by an interaction between *friends*' and target's interaction, such that a match between target's and *friends*' extraversion level resulted in higher scores on communal orientation. A 2 (target's profile) × 2 (number of *friends*) × 2 (profile pictures of *friends*) analysis of variance with communal orientation as dependent measure revealed a significant main effect of profile pictures of *friends*, $F(1,116) = 4.01$, $p < .05$, $\eta^2 = .03$. In line with H4, Anouk received a higher score on communal orientation when she had extraverted *friends* ($M = 3.55$, $SD = 0.38$) than when she had introverted *friends* ($M = 3.39$, $SD = 0.48$). This main effect was qualified by the predicted interaction with extraversion of *friends*, $F(1,116) = 6.42$, $p < .05$, $\eta^2 = .05$. However, the pattern was only partly as expected. If Anouk had an extraverted profile, she was indeed perceived as higher in communal orientation when her *friends* were also extraverted ($M = 3.61$, $SD = 0.41$) than when her *friends* were introverted ($M = 3.26$, $SD = 0.49$). There was no significant difference in the introverted target conditions ($M = 3.53$, $SD = 0.44$ for introverted *friends* and $M = 3.49$, $SD = 0.35$ for extraverted *friends*). H5 is therefore only partly supported.

H6 and H7 predicted effects of number of *friends* and extraversion of *friends* on social attractiveness. When social attractiveness was used as the dependent variable, only an interaction between number of *friends* and profile pictures of *friends* emerged, $F(1,116) = 3.98$, $p < .05$, $\eta^2 = .03$. The interaction had a cross-over pattern. If Anouk had extraverted *friends*, she was slightly, but not significantly, perceived as more socially attractive when she had 382 *friends* ($M = 3.07$, $SD = 0.70$) than when she had 82 friends ($M = 2.96$, $SD = 0.63$), $F < 1$, *ns*. If Anouk had introverted *friends*, the number of *friends* did significantly alter her social attractiveness, $F(1,116) = 4.99$, $p < .05$. Anouk was perceived as more socially attractive if she had only 82 *friends* ($M = 3.31$, $SD = 0.77$) than if she had 382 *friends* ($M = 2.89$, $SD = 0.81$). H6 and H7 are rejected.

Discussion

The goal of this experiment was to contrast the effects of self-generated, *friends*-generated and system-generated cues on impression formation on SNS. The research extended prior research by examining how far the pictures of their *friends* are used to draw inferences about the personality of the target. Prior research has already shown assimilation effects for physical attractiveness. The present study extended

these findings to extraversion of the *friends*. Moreover, the experiment tested the moderating role of the characteristic that has to be judged. It was argued that other-generated information is perceived as more valid and therefore more important when interpersonal traits have to be judged. The experiment showed that a target's profile, profile pictures of the *friends* and number of *friends* jointly influence impressions. Depending on the dependent variable, cue utilization varied.

With regard to popularity, the target's profile had a strong effect. Number of *friends* and profile pictures of *friends* had a marginally significant effect in the predicted direction. Only main effects occurred in this analysis, indicating that respondents combined the information provided by the three different cues additively. Although other-generated information had a marginal effect, there is no evidence for the warranting effect; self-generated information explained much more variance. It has been shown that people can reliably extract extraversion from SNS profiles (Gosling et al., 2007), and that extraversion is related to popularity and thus is a valid cue (Zywica & Danowski, 2008, see also Table 1). The present study found similar additive effects as Walther et al. (2009) for extraversion, but extended this research by adding system-generated information. Both types of other-generated information had an effect, albeit weak. However, the present study used profile pictures as the other-generated cue and not statements. The results show that people expect people to have similar *friends*; if the *friends* make an extraverted and outgoing impression, the target is perceived as more popular than when the *friends* make an introverted impression.

A different pattern emerged when communal orientation was used as the dependent variable. Self-generated information had no main effect any longer, and other-generated information became more important. Targets with extraverted *friends* were perceived as higher in communal orientation than targets with introverted *friends*. Extraverted persons are often perceived as more sociable (Jensen-Campbell et al., 2002; Lucas et al., 2000), and the extraverted *friends* were more often depicted in social situations. These reminders of pleasant social interactions were obviously attributed to a higher communal orientation of the target. It could also be that the pictures of extraverted *friends* primed positive affect and that this led to a more positive evaluation. Future research is needed to determine the underlying processes.

There was also an interaction between the target's profile and the profile pictures of the *friends*. The matching hypothesis was only partly supported. An extraverted target indeed received higher scores on communal orientation when the *friends* were extraverted than when the *friends* were introverted; but the opposite effect was not significant for introverted targets. However, the rank order of conditions was as predicted: Anouk received the highest two ratings in the two matching conditions. This pattern supports Donath's (2007) claim that people expect individuals to have similar friends. Taken together, *friends*-generated information had a higher impact than self-generated information on communal orientation, indicating that respondents rely more strongly on other-generated information when other-profitable traits have to be judged.

Interestingly, number of *friends* was not utilized when the communal orientation had to be judged, although it was used as a cue ($p < .06$) to determine the popularity of the target. This indicates functional achievement in cue utilization. There are studies confirming the validity of the number of *friends* as a cue in the domain of popularity (Tong et al., 2008; Zywica & Danowski, 2008), but until now there is no evidence that the number of SNS *friends* is related to communal orientation. A SNS *friend* is not necessarily a real friend (boyd, 2006), thus, the sheer number is not diagnostic of the quality of the friendships and the communal orientation of the target.

When it comes to social attractiveness, a more behavioral measure, self-generated information, had no influence at all. In contrast to the expected main effects, an interaction was found between number of *friends* and type of *friends*. The pattern suggests that a match between number and type of *friends* plays the central role; respondents especially preferred the target with relatively few introverted *friends*. This seems counter-intuitive at first glance, but an extraverted target might be perceived as popular but narcissistic (Buffardi & Campbell, 2008). As can be seen in Table 1, perceived extraversion of the target was not related to social attractiveness and was only weakly related to popularity. A target with many *friends* might also be perceived as superficial, and people might question the quality of those friendships. These results are somewhat in contrast with the findings by Tong et al. (2008) who reported an increase in social attractiveness when there were between 102 and 302 *friends* and a decrease only when the number of *friends* exceeded 302. However, the respondents in that study had almost twice as many *friends* as the respondents of the current experiment. SNS differ in culture and norms (boyd & Ellison, 2007), and the threshold for incredulity is obviously lower in Hyves. Another explanation could be that going out with an extraverted target with many *friends* might result in less attention for oneself. Thus, strategic considerations might have influenced the ratings on the more behavioral social attractiveness measure as well. These post-hoc explanations remain speculative; future research should try to replicate the pattern and test different explanations.

Further evidence for the claim that people use cues to make inferences over a variety of traits comes from the unexpected main effect of the target's profile on the number of *friends* manipulation check item. Respondents not only correctly perceived that Anouk had more *friends* when she had 382 and not 82 *friends*, but they also assumed that she had more *friends* when she had an extraverted profile. This might be due to the formulation of the manipulation check item. Respondents might have interpreted the term friends not only as SNS *friends*, but also as real friends. Independent of the number of *friends* displayed of the profile, they then made the inference that an extraverted target had more friends. Prior research has shown that people often automatically draw inferences (Uleman, 1999; Uleman, Newman, & Moskowitz, 1996), and this happens obviously also in SNS.

This research contributed to general theories on impression formation as well as to theories on impression formation in SNS. Although the varying effects across dimensions might seem a weakness at first glance, they show that people deliberately use and combine various cues when making judgments on different dimensions.

When it comes to popularity, the variable most closely related to the manipulated construct extraversion, the cues are used in quite a straightforward and an additive way. No warranting effect occurs; people trust the self-generated information. The picture changes if communal traits are judged. Communal traits are other-profitable traits, thus people pay more attention to the *friends*. Targets with extraverted *friends* score higher on communal orientation than targets with introverted *friends*, and this pattern is especially strong for extraverted individuals with extraverted *friends*. Thus, people expect others to have similar *friends* and use the match between the target's profile and the *friends* profile as additional cue. Moreover, number of *friends* is not considered as a valid cue in this context.

The measure of social attractiveness had a behavioral component; respondents were asked whether they would like to spend some time with the target. The focus is again on other-profitable aspects—would the respondent benefit by spending time with the target? This elicited strategic considerations which were based on the number and type of *friends* the target already had. Self-generated information had no effect; people relied strongly on other-generated information, as predicted by the warranting principle. The experiment also provides further evidence for the lens model (Brunswik, 1956; Gigerenzer & Kurz, 2001), indicating that validity and utilization of cues varies across constructs.

The present research extends prior research on information formation in online environments in several ways. First, it compared the effects of self-generated, *friends*-generated and system-generated information within the same experiment. Second, it examined the effects of the profile pictures of *friends*. This has been done for physical attractiveness by Walther et al. (2008), but not for extraversion. Extraversion was chosen not only because it is a central personality variable, but also because it is well known that extraverted subjects create different profiles (Krämer & Winter, 2008; Marcus et al., 2006) and that people are able to make reliable judgments on extraversion based on SNS profiles (Gosling et al., 2007). Most important, the research sheds light on the boundary conditions of the warranting principle (Walther & Parks, 2002). Across all three dependent measures, the profile pictures of *friends* played a role in main or interaction effects. However, other-generated information became more important when other-profitable traits had to be judged.

The experiment also showed that popularity on a SNS is not necessarily the same as being attractive as a real friend. This finding adds to the recent discussion on narcissism on SNS (Buffardi & Campbell, 2008). Having many friends increases one's popularity (Zywica & Danowski, 2008), but this might be positive only on the surface without resulting in deeper friendships.

There are also some limitations of the present research. Only screenshots and a very limited profile without wall postings, additional pictures, or gadgets were used. Respondents could not click on the profiles of *friends*; they only saw the small pictures. Nevertheless, these subtle manipulations had an effect. With the exception of the main effect of target's profile on popularity, the effects were rather small. However, similar effect sizes were found by Walther et al. (2008). Especially the effect

of extraversion of *friends* might have been stronger when the respondents could have viewed the full profiles of the *friends*. The findings on number of *friends* should be generalized to other SNS with caution. The average number of *friends* differs from one SNS to another, and might also change within a SNS. For example, the opening of Facebook to everyone has influenced the number of *friends* people have on Facebook. The more important finding is that people take the number of *friends* into account when making certain judgments, but whether a certain number of *friends* results in a positive or a negative evaluation depends on the norms of the specific SNS.

Nevertheless, this experiment shows that people use the cues provided on SNS, and that they use different cues when different dimensions have to be judged. Future research could focus more on the underlying considerations and test whether these inferences are drawn rather automatically or deliberately. Trait inferences are often made automatically (Uleman, 1999; Uleman et al., 1996), and the unexpected effect on the manipulation check for number of *friends* indicates that people also make automatic inferences on SNS. However, the degree of automaticity could also depend on the judged characteristic. It could be that the respondents automatically infer the popularity of the target, but think more carefully about whether they want to become friends with the target. Future research should also try to replicate the findings with other cues and other personality characteristics. SNS differ in their target groups, features, and norms (boyd & Ellison, 2007). Therefore, it might also be interesting to compare different SNS. SNS are becoming part of everyday life, not only in leisure contexts, but also in business contexts. To make a good impression, it is not enough to carefully construct one's profile; it is also wise to carefully select one's *friends*.

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Notes

1 *Friends* is set in italics when it refers to people in a profile owner's social network displayed on a SNS.

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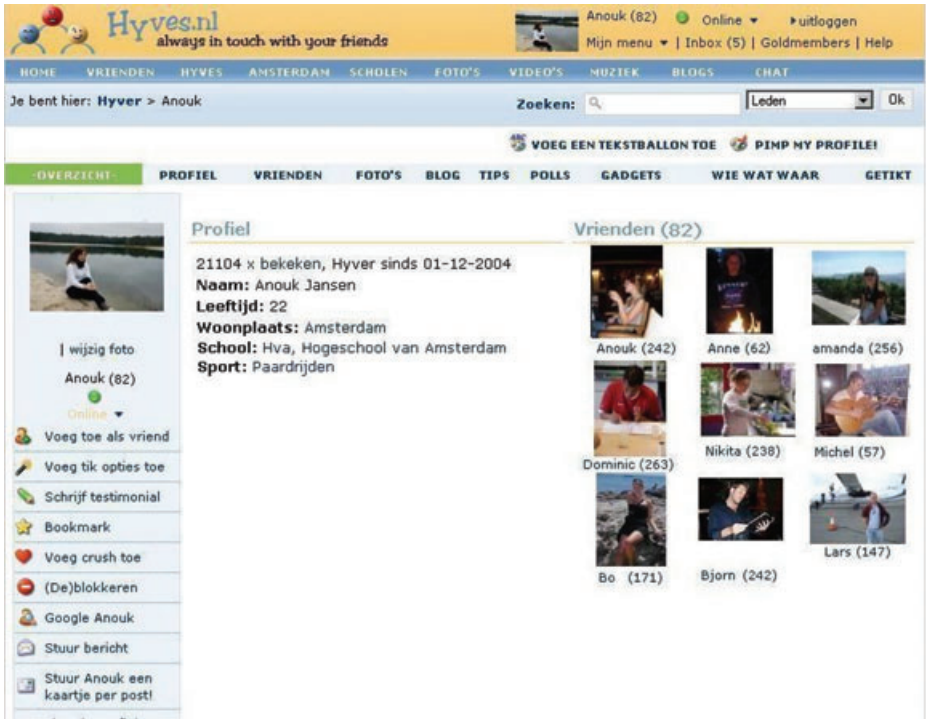
Appendix 1: Profile in the extraverted profile, extraverted *friends*, many *friends* condition

Note: translation of the profile elements: naam = name, leeftijd = age, woonplaats = place of residence, mijn merken = my favorite brands, spots = favorite places, school = school, TV programma's = favorite TV programs, reizen = travelling, films = favorite movies, sport = sports

Appendix 2: Profile in the introverted profile, introverted *friends*, few *friends* condition



Note: translation of the profile elements: naam = name, leeftijd = age, woonplaats = place of residence, school = school, sport = sports)