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Personality, sex and computer-mediated communication through the Internet

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Until recently, research about individual differences in computer-mediated communication (CMC) has focused on personal variables such as gender. There is little empirical information about differences in CMC related to personality. However, it has been widely speculated that introverted personality traits are especially appropriate for CMC. The results of the present study are consistent with these predictions. Introverted participants sent as many messages to the Internet forums analysed as did extraverted participants, and their messages contained more information. As regards gender, males sent longer messages than did females, but their messages did not contain more information.

Key words: *Computer-mediated communication, personality, extraversion, Internet, sex, gender, age.*

The Internet has ushered in new contexts of communication and inter-relations between people. One problem of increasing interest is whether differences in computer-mediated communication (CMC) styles are equivalent to those found in face-to-face

communication. However, much of the research conducted so far has focused on differences related to variables such as gender, and there are no studies about the relationship between CMC styles and personality.

According to the arousal theory (Eysenck, 1967), introverts are chronically more aroused than extraverts; they are, by nature, closer to their maximum arousal level. Therefore, they tend to avoid stress or trigger factors since, when exceeding their optimum arousal level, their performance deteriorates. In contrast, extraverts are chronically underaroused and search for stimulating situations that bring them closer to their optimum arousal level. One of the situations that generate higher levels of arousal is social interaction. As a result, introverts prefer activities that can be carried out in isolation (for example, reading rather than going to parties, etc.), while extraverts actively seek social interaction.

Introverts are slower to interact than extraverts because they are more reflective, whereas extraverts are more impulsive; an extravert does not require as much time to formulate an answer. Consequently, in a group situation, extraverts are the ones that set the pace of the discussion. By the time the introvert is confident about what he or she is going to say, the conversation has already moved on in a new direction (Livingood, 1995).

It should be borne in mind that the same situation in a face-to-face communication and real time may differ from the asynchronous communication which characterises online discussion forums. In this environment, participants have as much time as they need to process their messages and structure their answers. Introverts can calmly read a message from another participant, think about its content, write an answer, go over it again and send it when they are sure about what they want to say.

Therefore, if, in face-to-face and real time situations, extraverts intervene more often than introverts it is possible that in asynchronous situations the frequency of messages would be similar. Another possibility would be that the greater impulsiveness of extraverts would lead them to post more messages, but that introverts' messages would be longer; alternatively, they might be shorter (fewer words) but include more information (higher number of information units).

In Eysenck's model, a person with high neuroticism (unstable) is emotionally activated by a stimulus that is less intense than the stimulus needed to activate a person with low neuroticism (stable). Face-to-face communication contains more non-verbal signs and emotional contexts than does CMC, and thus an unstable person may feel more comfortable in a CMC context than in a face-to-face situation.

Research to date has focused more on the relationship between CMC styles and participants' gender rather than with personality. Studies of lexical-grammatical gender differences (Poynton, 1989) have shown that females are more people-oriented, talk more about themselves, reveal a higher number of thoughts and feelings and interact more with others. Maltz and Borker (1993) indicate that females use conversation primarily to

negotiate and express relationships, while males use it to establish control. Females are also more directed towards co-operation. In CMC the gender differences observed are similar to those in face-to-face communication. Herring (1993, 1994, 1996) reports that in CMC males tend to confront others, while females tend to give support. Furthermore, males write longer messages which are more often critical and prone to sarcasm, whereas females write shorter messages but express more doubts, suggestions and gratefulness. In forums, males bring up more topics for discussion than females and their arguments are mainly based on facts, whereas females have a way of arguing that is based on intuition and experience (Truong, 1993; Savicki, 1996; Savicki and Kelley, 2000; Ferris, 1996).

The present study analysed the messages sent to a discussion forum for university courses, and sought to identify possible differences related to personality, gender and age.

The questions addressed were the following:

1. Are there any differences in personality, gender or age between Internet users and non-Internet users?
2. Are there any differences in the total number of messages sent to the discussion forum in relation to personality, gender or age?
3. Are there any differences in the number of messages sent during the course (constancy of participation) related to personality, gender or age?
4. Are there any differences in the length of messages in relation to personality, gender or age?
5. Are there any differences related to personality, gender or age in the type of units of meaning used in the messages?

Method

Subjects

Group 1: 32 psychology students at the University of Barcelona aged between 21 and 49 years (25% males and 75% females).

Group 2: 32 Spanish and Latin American students from a postgraduate psychology class at the University of Barcelona. Ages ranged from 23 to 52 years (64% females and 36% males).

Instruments

The discussion forums in which students participated were part of a virtual campus (WebCT).

Students in Group 1 were given the EPQ (Eysenck Personality Questionnaire, 1982) with

the aim of evaluating their personality on three dimensions: extraversion (E), neuroticism (N) and psychoticism (P).

Procedure

In addition to quantifying the length, quantity, etc. of the messages sent to the discussion forums, the content of a sample was analysed with the aim of using a category system adapted from that developed by Barrett and Lally (1999). The seven categories used were defined as follows:

-INFORMATIVE: Statements in which objective information is stated (specific data, formal explanations, narrative of events, clarified examples, etc.) For example: 'During 1999 my city suffered two violent, natural phenomena'.

-VALUES: Expressions of personal point of view, opinions or subjective appreciations. Value judgements. For example: "I think the constitutional basis of one's personality is very important".

-INTERACTIVE: All courtesy phrases directed towards a specific person. Phrases or parts of phrases linked to previous messages are also included here. These refer either to one or more of the ideas put forward in the message or to an answer to some doubt or previous question. It also includes offers to provide information to one or more persons. For example: "Reconsidering Ariadna's idea..."

-SOCIAL: Phrases that are not related to a topic's formal content. This category includes social conventions, that is, greetings, good-byes, gratitude; generally, courtesy phrases, as long as they are not directed to a specific person (in this case they would be considered as interactive.) It also includes announcements in which personal aspects are explained, for example, name, age, work, studies, personal interests, expectations and personal experiences. For example: 'Greetings to everybody.'

METACOGNITIVE: Reflections about one's own thoughts and awareness of knowledge or lack of knowledge about a topic. For example: "One thing is for sure and that is that I cannot see it clearly."

QUESTIONS: Expression of doubt in direct or indirect form with the aim of becoming informed. For example: "Could anybody inform me about this topic?"

CONTEXTUAL: Statements lacking formal contexts and used to introduce the subject matter of what will be shown; connections or any type of expression that serves to situate the reader in the matter. For example: "I agree with the example."

Of the approximately 500 messages sent by Group 1, a random sample of 100 messages was selected for the study. The same was done for Group 2.

Two investigators were trained in the technique of content analysis, in accordance with the previously defined categories. They obtained an index of agreement of 0.89 in the analysis of messages sent by Group 1 and 0.87 for Group 2.

Results

The results obtained are presented with the aim of answering each of the questions posed above.

1. Are there any differences in personality, gender or age between Internet users and non-Internet users?

Group 1 consisted of 32 psychology students from the same course. At the beginning of the course they were offered the possibility of using complementary online resources, one of which was a discussion forum about course content. Fourteen of the students decided to use it and 18 decided not to. In a subsequent session the EPQ questionnaire was administered to this group. Statistical analysis using t-tests found no significant differences on any of the personality measures between students who used Internet and those who did not.

The chi-squared test revealed no distribution differences between the male and female students who used Internet and those who did not. Finally a new t-test showed that the average age of students who used Internet (26.9) was not significantly different from that of the students who did not (24.3). Therefore, there were no personality, gender or age differences between students who decided to use Internet and those who did not.

2. Are there any differences in the total number of messages sent to the discussion forum related to personality, gender or age?

In Group 1, where the personalities measures were taken, it was observed that stable individuals sent more messages than did unstable individuals ($p=0.007$), and that those with low P sent more messages than did subjects with high P ($p=0.003$). There were no differences between the messages sent by introverts and extraverts. In order to carry out these comparisons, N, E and P were recoded by their respective median and a binomial test was applied to determine whether the distribution of the two groups was 50%. The observed proportion of stable subjects' messages was 0.71 (0.29 for unstable subjects). The proportion of introverts was 0.51 (0.49 extraverts). The low-P proportion was 0.73 (0.27 high P).

In a similar way, the binomial test was then applied to determine whether the distribution of messages sent by females and males in Group 1 was similar to the gender distribution of the sample. There were no significant differences ($p=0.13$) between the observed proportions of messages sent by females and males and their expected

proportions. Similar results were found in Group 2 ($p=0.4$).

Differences were found between the messages sent by younger and older students in Group 1. Younger students (below 23 years old) sent more messages than did older ones; indeed, 70% of messages were sent by the younger students. Since 23 years was the median age, it was expected that 50% of messages would be sent by each group. The difference between the expected and observed proportions was significant ($p=0.01$). The median age in Group 2 was higher (32 years), and when recoding this variable into two categories (above and below the median age) no significant differences were found ($p=0.6$) between expected and observed messages sent by subjects in each age group. When comparing the number of messages sent by students younger than 23 years old with those sent by older students (8% and 92% of the sample, respectively) we found a significant difference ($p=0.001$) between expected and observed proportions of younger and older students; this was equivalent to the finding for group 1, where younger students sent twice as many messages (17% of the total) than expected.

3. Are there any differences between the number of messages sent during the course (constancy of participation) related to personality, gender or age?

We used analysis of variance to compare the scores in E, N and P of the students in Group 1 who sent messages every month during the course. No differences were found in N and P, but there were some in E. During the first few months of the course most messages were sent by students with high E values, but their participation decreased as the course continued. Introverts maintained a constant participation ($F=2.82$; $p=0.05$).

A non-parametric test (Lambda) was applied to see whether the differences in the number of messages sent by males and females in Group 1 over the months were significant. A Lambda value of 0.818 was obtained, indicating that males and females participated with the same constancy. Males and females in Group 2 also participated with the same constancy (Lambda value of 0.10; $p=0.31$).

We then considered Group 1 in terms of the messages sent by students older or younger than 23 years old over the months in order to determine whether there were any significant differences in the number of messages sent. The obtained value (0.562) indicated that there was no difference in participation constancy between younger and older students. Neither were there any differences in the constancy of participation according to age in Group 2.

4. Are there any differences in the length of messages related to personality, gender or age?

Here we found a negative correlation of marginal significance between extraversion and the number of significant units ($r=-0.27$; $p=0.06$), which indicates that introverts propose a greater number of ideas in each message than do extraverts. The remaining correlations between each personality trait (E, N, P) and, on the one hand, the number of

words and, on the other, personality traits and number of significant units did not reach significance. The first of the two measurements of message length (number of words) can be considered as an indicator of verbal fluidity, while the second (number of significant units) is an indicator of fluidity of ideas.

We used the Student's *t* test to compare the median length of messages sent by males and females, and found that although males wrote longer messages in terms of the number of words, there were no differences in the number of significant units. The median length of male messages was 131 words compared to 107 for females ($t=-1.98$; $p=0.05$). Similar results were found in Group 2, with no differences between males and females in the number of significant units, but with a tendency for males to write longer messages (mean of 171 words per message compared to 134 for females); this difference is only marginally significant ($t=-1.76$; $p=0.08$).

We also calculated the correlation between age of subjects and the length of messages. Although these were non-significant in Group 1, in group 2 (probably due to the greater age range) we observed significant positive correlations between age and length of messages, whether this was quantified as number of words ($r=0.214$, $p=0.03$) or number of significant units ($r=0.217$, $p=0.03$). Thus, older people write longer messages with more information.

5. Are there any differences related to personality, gender or age in the type of significant units used in the messages?

As regards correlations between personality measures and the number of significant units for each category there was no clear tendency in terms of the categories used by stable or unstable people, nor between the categories used by subjects with high or low P. When compared to extraverts, introverts showed a tendency to use more value-based and metacognitive categories ($r=-0.24$, $p=0.10$; $r=-0.28$, $p=0.06$); they also used more contextual categories than did extraverts ($r=-0.3$, $p=0.04$). The same results appeared when dichotomising E by the median and comparing the mean use of each category by introverts and extraverts.

When comparing the use of each significant unit's category by males and females in Group 1, we found that males asked more questions than did females ($F=4.179$; $p=0.044$). There were no clear differences in the remaining categories. In Group 2, significant gender differences were found in the use of contextual ($F=4.54$, $p=0.03$) and interactive ($F=3.88$, $p=0.05$) significant units; males in this group used more contextual and interactive expressions.

Although no significant correlation was found between age and categories in Group 1, the highest ones indicated the following trends: younger students tended to formulate more value-based statements than did older students ($r=-0.24$; $p=0.11$) and older students tended to ask more questions than did younger ones ($r=0.23$; $p=0.13$). When performing an ANOVA with the number of significant units of each category as the dependent variable

and codified age (younger and older than 23 years old) as a factor, the same trends were found in the difference between younger and older subjects in the use of questions, and now the differences are significant ($F=4.35$; $p=0.04$). In Group 2, a significant correlation was found between age and the use of interactive expressions ($r=0.23$; $p=0.01$).

Discussion

No differences in personality, gender or age were found between students who decided to use Internet and those who decided not to. The studied group of students belongs to the general age group most widely associated with Internet use, and thus there were no expected differences related to this variable in terms of the decision to use the proposed online resources. However, there is a gender difference in the use of Internet. In Europe, as in the United States, the percentage of male users is higher than that of females. The research survey conducted by the *Graphic, Visualization, & Usability Centre* (1998) revealed that 81% of Internet users in Europe were males. In the United States the difference was smaller, with 64% male users. Access to Internet became widespread in the United States before it did in Europe, and this suggests that Internet use by males and females levels out over time. Previous studies support this hypothesis, since the survey by GV&UC in 1994 found that 95% of Internet users were males. As, in the present study, there were no gender differences among students in terms of the decision to use the online resources on offer, it would appear that the population studied (university students) is more similar to the general population of developed countries, such as the USA, when it comes to the use of Internet, rather than to the general Spanish population.

In terms of CMC, the degree of participation by subjects in online discussion forums is related to personality and age, but there were no differences between males and females. Younger students participated more than older students, and stable students more than unstable students. Students low in P participated more than high-P students, although overall participation levels were similar for extraverts and introverts. However, extraversion did influence the constancy of participation over the course, since during the first few months the majority of messages were from extraverts; their participation then decreased progressively while that of introverts remained constant. Constancy in participation does not seem to be influenced by age or gender.

Another difference between introverts and extraverts is that introverts formulated a greater number of ideas (number of units of meaning) in each message, although there were no differences in the number of words. No other relationships were found between measures of message length and other measures of personality. However, gender differences were observed. Males wrote longer messages, although there were no gender differences in the number of expressed ideas (number of units of meaning). In addition, message length was found to be related to age. Older subjects wrote longer messages (number of words) containing more information (number of units of meaning).

There did not appear to be any differences between stable and unstable people with respect to the category of the units of meaning used, nor between high and low P. As

regards extraversion, introverts were found to use more contextual units of meaning and tended to use more value-based and metacognitive expressions. In relation to gender, males asked more questions and used more contextual and interactive expressions. No clear differences were found for the remaining categories. Younger students tended to express more value statements than did older ones, whereas the latter used more interactive expressions and tended to ask more questions.

In terms of personal variables, neuroticism and psychoticism were only related with the total participation level in the online discussion forums. Stable students and those with low P participated more than did unstable and high P students.

Extraversion is the personality dimension most strongly related to the CMC variables analysed in this study. The total level of participation by extraverts and introverts in discussion forums was similar, but introverts were more constant than extraverts. Extraverts started with a high level of participation but this gradually decreased over the course. Neither do their respective messages differ in length, although they did in terms of the number of expressed ideas: introverts expressed a greater number of ideas. This greater fluidity is achieved through the same message length as that used by extraverts but with a more efficient style of communication. Differences were also found between introverts and extraverts in the type of units of meaning. The former use more contextual expressions and tend to use more metacognitive expressions and value statements. Since there are no available data in the current literature, discussion must be limited to reports such as that of Livingood (1995). This author refers to “the revenge of the introverts”, in the sense that their personal characteristics are better adapted to CMC in general and to online communication in particular. In contrast to face-to-face interaction, in contexts such as CMC introverts not only post as many messages as do extraverts but their messages also have the same length and even contain greater amounts of information; they also show greater constancy. Indeed, the messages of introverts are characterized by a greater use of contextual expressions, judgments of value and reflections about their own knowledge.

No differences were found between males and females in terms of their participation in online forums, or in their constancy during the course. As reported in previous literature (Herring, 1993, 1994, 1996; Truong, 1993; Savicki and Kelley, 2000; Ferris, 1996), males wrote longer messages than did females. However, a new finding of the present study is that messages from males did not have any more content than those of females, since the number of units of meaning remained the same. Males did ask more questions in their messages and used more contextual and interactive expressions.

Younger students had a higher overall level of participation. However, there were no differences between younger and older students in terms of constancy over the course. Older people wrote longer messages with a greater amount of information. As regards the ideas expressed, younger students tended to express more value statements while older students used more interactive expressions and tended to ask more questions.

Conclusion

Research into individual differences related to CMC is of great interest. However, most studies have focused on variables such as gender, and information regarding personality is lacking. It has been speculated that the intrinsic characteristics of the introvert personality are better suited to CMC, and the results of the present study support this hypothesis. For introverts, CMC is an appropriate context for social interaction. This is probably due to the fact that the situation generates less activation, as well as to the absence of non-verbal signs and the better control over the pace of interaction (monitoring it in line with their tendency toward reflection and their low impulsivity). This study only reveals differences between introverts and extraverts, and provides no information about the mechanisms behind these differences. Further research is thus needed in which variables such as the level of activation present in the situation and the pace of the interaction are actively manipulated.

The differences observed regarding gender also support previous findings, although the explanation for this remains speculative. The absence of non-verbal signs in CMC may be a key factor in this regard: the lack of non-verbal signs seems to be appropriate for males' style of communication, but not for females'. Some studies that support this hypothesis (Katzman, 1994; Witmer and Katzman, 1997) found that females use more iconic emotional expressions (*emoticons*). These *emoticons* would be used as a way of compensating for the absence of non-verbal signs in CMC. This hypothesis could also be tested experimentally. Indeed, it would be of great interest to perform an experiment in which the quantity of non-verbal signs present (adding, for example, audio or video to the written text) was manipulated in order to see how this variation affects the differences between males and females in CMC.

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