Communication is More than Information Sharing: The Role of Knowledge

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Abstract

In cheap talk games where senders' accuracy of information depend on their background knowledge, a sender may want to signal that she is knowledgeable due to social image concerns. The social image benefits may, in turn, depend on the type of knowledge and its perceived social status. Experimentally, I study a cheap talk game with completely misaligned preferences where the sender transmits knowledge-based information to the receiver. In two treatments I provide senders with multiple-choice questions on (1) general knowledge and (2) tabloid topics, thereby varying the social status of the knowledge area. I find that truth-telling rates are significantly higher in the former case and the driving channel is the ability to signal knowledge.

Keywords: Cheap Talk · Communication · Social Image · Information

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1 Introduction

In situations of advice where a sender with an informational advantage sends a message to an uninformed decision-maker, the sender often requires background knowledge to interpret the information at hand. Imagine, for instance, a lobbyist who advises the government on regulation policies in the banking industry. When the lobbyist receives new information (e.g., key financial information from banks), she has to possess the necessary skills to adequately interpret the data and extract the true content (e.g., financial risks). The messages that she transmits to the government thus not only convey information about the banking sector, but also about her own expertise. By sending a truthful message the sender can reveal that she was able to draw the correct inferences.[1]

When information depends on senders' background knowledge, senders who care about their social image may be intrinsically motivated to demonstrate knowledge by telling the truth. A natural implication is that the scope and the (positive or negative) nature of social image utility depend on the specific type of expertise transmitted by the information. Following the concept of identity utility (Akerlof and Kranton, 2000), different areas of expertise vary in the social status that they convey. The social status of expertise can be derived from how a given type of knowledge is evaluated in the social system. In organizations, for instance, the value of knowledge is evaluated on the basis of its direct benefits (e.g., the usefulness to achieve a task and its uniqueness or accessibility by others), the manner in which the knowledge was obtained (formal education has a higher perceived value than informal education) and implicit benefits from having the knowledge (feeling pride, power) (for a survey on the value of knowledge see Ford and Staples, 2006).

In this paper, I experimentally study the transmission of knowledge in a sender-receiver game with misaligned preferences and compare the transmission from two subjects areas of differing social status. To derive theoretical predictions, I assume a simple theoretical framework where the private information senders receive is not sufficient to infer the state of the world, but requires a certain expertise. The expertise of the sender is exogenously given by her prior education, training, interests, etc. I assume that there are two types of senders, informed (who are knowledgeable and learn the state) and uninformed. For informed senders who care about their social image, I show theoretically that with increasing social status of the subject area there is a switching point where they turn from babbling to truthful reporting. Similarly, receivers' probability to trust the message increases with the social status of information.

In the experiment senders receive a multiple choice question with four answer options, of

[1] Assuming that at some later stage the receiver will be able to judge the correctness of the message.

which one option is correct. Senders (receivers) gain a high (low) payoff when the receiver chooses a wrong answer and a low (high) payoff when the receiver chooses the correct answer to the question. In this setting, a payoff-maximizing sender who does not care about social image is predicted to reveal no information in equilibrium. In the high social status treatment, denoted as *high*, senders receive questions on general knowledge topics (e.g., geography, history, literature), whereas in the low social status treatment, called *low*, questions cover topics such as tabloid TV, celebrities, sports and alcoholic drinks. The multiple choice questions were pre-tested to measure the difficulty of each question and the social status of the respective knowledge area. I find that correct messages in *high* amount to 46%, while only 32% in *low*. Moreover, I show that the driving channel is the ability to signal knowledge. When this opportunity is removed, the difference between *high* and *low* vanishes. In these so-called *no-signaling* treatments can only signal the competence of a third person and, thus, senders cannot show their own knowledge through their message. In addition, I find that the more difficult the question is, the more likely senders are to report a correct message within the same subject area. Difficulty is measured in terms of how many subjects in the pre-study were able to answer the question correctly. It thus allows subjects to determine their relative knowledge level (within the student population) and reveal this to the receiver, which can also serve as a sign of social status. The difficulty effect also disappears when the possibility to signal knowledge is eliminated.

My experimental results demonstrate that knowledge-based information can enlarge the scope of truth-telling equilibria in sender-receiver games when senders care about being positively perceived by others. This paper contributes to a theoretical literature that studies communication and reputational concerns which assumes that sender do not only want to trigger a certain action through communication but also wants to be perceived as knowledgeable. In Sobel (1985) and Morris (2001) senders care instrumentally about their reputation (in order to be perceived as credible in the repeated game). Levy (2007) and Swank and Visser (2007) study the interaction of career concerns and transparency of the decision-making process in a committee. This paper differs in two regards. First, there is no instrumental benefit of the sender to build a reputation of being knowledgeable. I therefore propose a theoretical framework where the sender derives direct utility from showing off through revealing her knowledge.[2] Second, I experimentally show that the psychological benefit depends on the social status of the knowledge area, which has not been explored yet.

This paper also relates to a number of studies which show that exaggerated self-assessments are related to social signaling. Burks et al. (2013) provide evidence that people who care about

[2] At the end of Section 2 I discuss the alternative specification where the sender cares about being perceived as knowledgeable.

their social image make overly optimistic self-assessments. Ewers and Zimmermann (2015) provide causal evidence for this relationship. In their experiment people are willing to give up money to signal high ability. Individuals report higher ability in front of an audience compared to a situation where statements are private. Charness et al. (2013) show this effect in a strategic interaction where individuals use exaggerated self-assessments to deter entry of others.

The experimental literature on communication in cheap talk games has previously studied the role of behavioral motives to explain the frequently observed overcommunication (e.g., Gneezy, 2005; Cai and Wang, 2006; Sánchez-Pagés and Vorsatz, 2007, 2009), which are independent on *what* is being communicated. While standard theory predicts people to misreport information (Crawford and Sobel, 1982), a recent meta study on preferences for truth-telling (Abeler et al., 2016) identifies three types of motives: (1) a preference for being honest, i.e., individuals face a lying cost when deviating from the truth (Kartik et al., 2007; Kartik, 2009) or gain extra utility from being honest (Sánchez-Pagés and Vorsatz, 2007; Ellingsen and Östling, 2010), (2) a preference for being perceived as honest, i.e., individuals care about their reputation (Mazar et al., 2008; Fischbacher and Föllmi-Heusi, 2013; Utikal and Fischbacher, 2013; Gneezy et al., 2016), and (3) social norms, i.e., individuals care about descriptive social norms or social comparisons. For instance, individuals feel less bad about lying when they believe others are lying as well (Rauhut, 2013; Diekmann et al., 2015).[3] This paper adds a further motive for truth-telling: Social image concerns drive people to report honestly their high-status knowledge. This becomes crucial once information (*what* is being communicated) depends on sender's knowledge.

The remainder of the paper is organized as follows. The next section introduces the model. Section 3 presents the experimental design, Section 4 the results from the experiment, and Section 5 concludes.

2 Theoretical Framework

I provide a simple framework that captures the experimental sender-receiver game of knowledge transmission and illustrates how information depending on background knowledge and social

[3]Another strand of literature explains overcommunication by bounded rationality (e.g., quantal response equilibrium and level-k model) (Cai and Wang, 2006). Note that many experimental sender-receiver games involve up to five possible states of the world and a non-linear payoff function In these complex games strategic thinking involving different "depths" is more likely to play a role. Strategic-games with two states of the world and zero-sum structure structure as it is employed in this experiment or individual lying experiments as the widely applied die-rolling paradigm introduced by Fischbacher and Föllmi-Heusi (2013) are considerably easier. In the die-rolling paradigm subjects observe the outcome of a six-sided die roll, report the outcome and receive a payoff proportional to their report.

image concerns can influence truth-telling. The game deviates from a standard sender-receiver game (Crawford and Sobel, 1982) in two ways. First, the information's precision depends on the sender's characteristics. Second, sender may derive social image utility from showing their knowledge.

There is a set of two players $N = \{S, R\}$, a sender (S) and a receiver (R). Both sender and receiver know the distribution of the state space. The true state of the world θ is drawn from the state space Θ with uniform distribution over n states. The sender privately observes a signal $\widehat{\theta}$. Whether this signal is informative depends on the sender's type, which is drawn from the type space $T = \{\emptyset\} \cup \Theta$ where $\emptyset$ means being uninformed. With a commonly known probability t the sender is informed and learns the state and with $1 - t$ she is uninformed. The idea is that the private signal the sender receives does not contain the true state of the world, but only some information that together with some background knowledge may allow the sender to extract the true state. This background knowledge is exogenously given and depends on sender's prior education, knowledge in the subject area, etc.

Subsequently, the sender sends a message $m \in \Theta$ to the receiver and the receiver takes an action $a \in \Theta$. Payoffs $\pi_i(\theta, a)$ for $i = \{S, R\}$ depend on the receiver's action, not on the message. If the action and the state coincide ($a = \theta$), the sender earns a payoff of $\pi_S = 0$ and the receiver $\pi_R = \alpha$; if there is a mismatch ($a \neq \theta$), the sender earns a payoff of $\pi_S = \alpha$ and the receiver $\pi_R = 0$. After the sender has chosen her message and the receiver his action, both players receive their payoff and learn the correct state.[4]

I assume that utility has two sources: monetary payoffs $\pi(\theta, a)$ and social image utility $I(m, \phi)$.[5] Utility is given by

$$U(\theta, a, m) = \pi(\theta, a) + I(m, \phi)$$

with

$$I(m, \phi) = \begin{cases} \phi & \text{if } m = \theta \\ 0 & \text{if } m \neq \theta \end{cases}$$

The monetary payoff $\pi_i(\theta, a)$ enters linearly in the utility function and all components are additively separable. The image utility component captures that the sender may receive a psychological benefit by demonstrating her knowledge to the receiver, i.e., via sending a correct message to the receiver.[6] $\phi \in [\underline{\phi}, \overline{\phi}]$ specifies the size of image utility and integrates two components. First,

[4] I refer to the sender in the feminine and the receiver in the masculine.

[5] Senders are also likely to exhibit lying aversion whose strength is expected to be heterogeneously distributed (Gibson et al., 2013). As lying aversion should assume a constant role in all treatments, I do not include it in the model for simplicity.

[6] Note that under this specification an uninformed sender would also derive image utility when she accidentally

some senders care more about showing their expertise than others (*individual weight*). Second, the social image a sender derives from transmitting knowledge depends on the social status of knowledge (*social status weight*), which in turn may rest on a variety of sources: uniqueness of the information (i.e., how many people have access to this information), difficulty to access the information, reputation of the respective knowledge areas, etc. In the experiment ϕ will be exogenously manipulated by varying the social status of information and the uniqueness of information. For the analysis, I assume ϕ to be identical for all senders and commonly known. In the game, only the sender can derive image utility as the receiver's action does not allow to signal knowledge.

Due to the symmetry of the game I can reduce the strategy space of the players in a straightforward way. A mixed strategy σ_S of the sender specifies the probability that a given message is truthful ($m = \theta$). A mixed strategy σ_R for the receiver specifies the probability of trust. The receiver can either follow the message ($a = m$) or distrust it ($a \neq m$). This reduction is feasible because all states are equally likely and the payoffs only depend on matching the true state.[7]

The equilibrium analysis can disregard the uninformed type as the uninformed sender cannot condition her message upon the true state and therefore cannot optimize. In case of an uninformed sender, the expected payoff for the sender and the receiver are $(n-1)\alpha/n$ and α/n, respectively (independent of the receiver's action). In the following I will therefore only focus on the case of the informed sender.

Plugging the game's payoffs into the above utility function yields the following normal-form game representation:

		Receiver	
		Follow	¬ Follow
Sender	Truth	(ϕ, α)	$(\alpha + \phi, 0)$
	¬ Truth	$(\alpha, 0)$	$\left(\frac{(n-2)\alpha}{n-1}, \frac{\alpha}{n-1}\right)$

Fig. 1: Normal form representation of the subgame played by t_H

Note that in the case the sender sends a wrong message and the receiver does not follow the message, there is a chance of $1/(n-1)$ that the correct state is picked by the receiver. Therefore,

sends a correct message. This however has no behavioral consequences as she cannot make a strategic choice. One could also rule out this feature and follow the philosophical literature that assumes that any definition of knowledge should rule out lucky guesses (Gettier, 1963). Recent work in experimental philosophy shows that this epistemic intuition is shared by people across different cultures (Machery et al., 2015).

[7] This simplification of the strategy space has been used by Sánchez-Pagés and Vorsatz (2009).

in this case the expected payoff for the sender and the receiver is $(n-2)/(n-1)$ and $1/(n-1)$ respectively.

The game can be analyzed as a simultaneous move game since the receiver cannot learn anything from the sender's action. Depending on the parameter of ϕ I can derive the following equilibria.

Proposition 1. *For $\phi = 0$ the unique mixed strategy Nash equilibrium is $\sigma_S^* = \frac{1}{n}$, $\sigma_R^* = \frac{1}{n}$ with the corresponding belief $\mu^*(\theta|m) = \frac{1}{n}$. The sender mixes evenly (his message reveals no information) and the receiver picks an action randomly.*

Proposition 2. *For ϕ sufficiently large ($\phi \geq \alpha$) there exists a unique Nash equilibrium in pure strategies where senders always send the correct message ($\sigma_S^* = 1$) and the receiver always follows ($\sigma_R^* = 1$). The corresponding belief is $\mu^*(\theta|m) = 1$. For intermediate ϕ ($\alpha > \phi > 0$) there is a unique Nash equilibrium in mixed strategies defined by $\sigma_S^* = \frac{1}{n}$, $\sigma_R^* = \frac{1}{n} + \frac{1}{n}\ \beta$ with the corresponding belief $\mu^*(\theta|m) = \frac{1}{n}$ The sender mixes evenly (his message reveals no information) and the receiver is more likely to follow the message than to oppose it.*

Note that there is a fully information-revealing equilibrium if ϕ is sufficiently large, i.e. when individuals value image utility highly and/or the social status of knowledge is sufficiently high. More generally speaking, an increase in the social status of information reduces the minimum value of the individual image weight that is required such that the condition $\phi \geq \alpha$ holds. Although the value of ϕ is difficult to interpret, it will be shown in Section 3 that the treatments can be ordered in terms of their social status.

The theoretical predictions allow me to derive comparative statics for the experiment.

Hypothesis 1. *In sender-receiver games with knowledge transmission and misaligned preferences, an increase in the social status of the subject area makes senders who care about social image more likely to tell the truth and receivers more likely to follow the message and to believe that senders tell the truth.*

Note that the above hypothesis captures situations where the information provided by the sender stems from her own knowledge. Predictions are different in situations where the sender cannot signal knowledge, i.e. where information does not depend on sender's background knowledge. In that case the sender derives no longer image utility. This means that the particular type of subject area should not affect the sender's communication behavior.

Hypothesis 2. *In sender-receiver games with information transmission and misaligned preferences an increase in the social status of the subject area has no effect on the communication of senders, the trusting behavior of receivers and receivers' beliefs about senders' behavior.*

An alternative way to model the sender's utility function is to assume that senders wish to appear well informed (or intelligent). The receiver updates his belief μ that the sender is an informed type after having received the message and being informed about the true state. The sender derives a psychological payoff $v(\mu)$, where v is an increasing function. If the psychological benefit is large enough, there should be a separating equilibrium where informed sender choose a strategy that distinguishes them from the babbling of uninformed types. In these fully informative equilbria senders could always tell the truth but also always lie (more generally, use any strategy where messages perfectly correlate with the state). Among these equilibrium strategies, telling the truth would maximize the receiver's belief μ. This specification therefore yields a qualitatively similar prediction. Given that the main interest of the paper is to provide evidence that showing knowledge induces truth-telling and that this depends on the social status of the knowledge area, I leave it for further research to explore whether the psychological benefits are driven by an intrinsic desire or depend on the receiver's belief.

3 Experimental Design

The theoretical framework suggests that truthful communication of information depends on (a) the ability to signal knowledge, and (b) the social image she derives from revealing this information. To test the hypotheses derived in Section 2, I conduct a 2x2 between-subjects design where I vary (1) whether the information's precision depends on sender's background knowledge, and (2) the social status of the subject area. On a within-subjects level I vary the difficulty level of questions, i.e., the likelihood that the sender can extract the correct state from the given information. Presumably the more difficult questions confer more social status and thus more social image utility. Thus, the social status is varied along two dimensions: the subject area and the difficulty.

Table 1: Treatments

		Signaling ability	
		Yes	No
Social Status	Low	Signaling-Low	No-Signaling-Low
	High	Signaling-High	No-Signaling-High

In the sender-receiver game senders receive multiple-choice questions from two different subject areas. In the *low* social status treatment I use questions from the tabloid press (henceforth denoted tabloid questions). Topics include tv-series, music, alcoholic beverages, and commercials. The *high* social status treatment employs questions covering various general knowledge

topics such as history, geography, economics, and art (henceforth denoted knowledge questions) (see Table 2 for exemplary questions and Appendix A.2 for an overview of all questions and summary statistics).

The questions were tested in a pre-study to measure the difficulty and the social status of the respective knowledge area. After a completely unrelated experiment, 96 subjects received 50 questions out of which 48 subjects received knowledge and 48 subjects tabloid questions. For each correctly answered question they earned a prize of 6 cent, in total up to 3 Euro.

Table 2: Examplary questions

Treatment	Question and Answers	Correct	Easiness
Low	Who left the boy band Take That in 1995?	d)	easy
	a) Gary Barlow b) Mark Owen c) Jason Orange d) Robbie Williams		(90%)
Low	Which actor plays Bilbo Baggins in The Hobbit?	d)	difficult
	a) Elijah Wood b) Benedict Cumberbatch c) Morgan Freeman d) Martin Freeman		(40 %)
High	Which gemstone is green?	c)	easy
	a) Opal b) Ruby c) Emerald d) Sapphire		(90%)
High	What is the name of the mathematician credited with a famous concept in game theory, named after him?	d)	difficult
	a) Carl Friedrich Gauss b) Alan Turing c) Bernard Bolzano d) John Nash		(40 %)

Notes: The number in brackets in column *Easiness* denotes the percentage of correct answers in the pre-study.

Out of the 50 questions, 15 were selected for each treatment of the experiment (and a further 15 for a post-experimental test). The 15 questions can be grouped into three levels of difficulty by the frequency of correct answers. There are five easy (80-90%), five intermediate (55-75%) and five hard questions (40-50%). Note that the hardest level of 40% is clearly above the level of 25% that random guessing would produce. The average difficulty level of all 15 questions is nearly the same across treatments (62.9% with standard deviation of 15.2% in *low* vs. 63.1% with standard deviation of 14.5% in *high*). In all treatments, senders and receivers are informed about the difficulty of each question: they receive the percentage of correct answers for each question (rounded to the 5%-level). Beliefs about the difficulty of the answer are thus held constant across treatments as well as sender and receivers.

To verify that the questions in *high* and *low* actually evoked a different social status, I included a social status elicitation in the pre-study. Subjects were asked to assess how being good at answering the questions correlates with a set of six characteristics (intelligence, memory, success in studies and life, curiosity, openness for experiences and extraversion) and to indicate

how important they perceive these characteristics.[8] To elicit a *social* image and not subjective assessments for the first question, subjects were told to choose the answer they thought was chosen by most participants (for a similar procedure see Krupka and Weber (2013)). I find that the questions from the two knowledge areas are clearly associated with a different social status. In 4 out of 6 characteristics (curiosity, success, memory and IQ) the *high* questions were significantly evaluated higher than the *low* questions. Extraversion was significantly more highly evaluated in *low* and for openness there are no differences between treatments. I also find significant differences between both subject areas when I construct an weighted average over all characteristics for each subject that weights each characteristic by its perceived importance. This so-called social status score amounts to 0.61 in *high* and 0.27 in *low* (two-sided Mann-Whitney Test, $p = 0.0048$, MW henceforth).[9]

The sender-receiver game with questions from the respective subject areas is implemented (a) with signaling ability and (b) without signaling ability, i.e., whether the sender is able to signal her expertise via the message. In the *signaling* treatments senders can extract the true state by solving the multiple-choice questionn and can thus show their knowledge to the receiver. However, in the *no-signaling* treatments senders can only transmit the knowledge from a third person. They receive the question (and not the four answer options) and a randomly picked answer from the pre-study. The senders learn only the letter of the picked answer (a, b, c or d) such that they cannot make any inference about the correctness of the random answer. Nonetheless, the subjects know the likelihood of the randomly picked answer to be correct. The instructions make clear that the probability of the randomly picked answer from the pre-study to be correct is equal to the percentage of correct answers. Consequently, the precision of the information does not depend on the sender's characteristics but is exogenous. In the *no-signaling* treatments the sender's choice to truthfully reveal the pre-study's signal can therefore not be driven by image concerns.

[8] Furnham and Chamorro-Premuzic (2006) measure the correlation between general knowledge, personality and intelligence. Their personality measures included some of the above-mentioned characteristics. In their experiments they found a consistent positive correlation of general knowledge with general intelligence (Wonderlic test for fluid and crystallized intelligence) and a positive, albeit less consistent, correlation with openness.

[9] Note that social image may also play a (limited) role in the pre-study. Although there is no other subject who receives the answer, subjects may derive image utility from showing their knowledge to the experimenter. The positive social status of both subject areas, however, guarantees that there are no conflicting social image incentives in the pre-study. Subjects have a monetary incentive to tell the truth and may gain a positive social image from showing their knowledge. For further details on the elicitation procedure, results and the social status measure see Appendix A.1.

Experimental Procedure The experiment contains six parts: (1) sender-receiver game, (2) belief elicitation, (3) social status elicitation, (4) an expertise task, (5) a socio-demographics questionnaire, and (6) revelation of results from (1)-(4).

In the sender-receiver game subjects were randomly assigned to one of two roles, participant A (sender) or participant B (receiver). The game is played 15 times as a one-shot game without feedback, i.e., first all senders complete their task, they choose a message for each of the 15 questions (i.e., senders cannot abstain from sending a message). Then the receivers take an action choice for each question and its corresponding message. The sequence in which questions occur is randomly determined for each session. For each question senders and receivers are randomly matched.[10] The four answers to the questions are labeled with a, b, c, or d and the message the receiver obtains only contains the classifier a, b, c, or d. The receiver knows the question but not the answer options, such that he cannot infer the correct answer. Payoffs are as follows. If the receiver chooses the correct answer to the question, he earns 9 Euro and the sender 6; when an incorrect answer is chosen, the receiver earns 6 Euro and the sender 9 Euro. At the end of the experiment one of the questions is randomly chosen for payment.

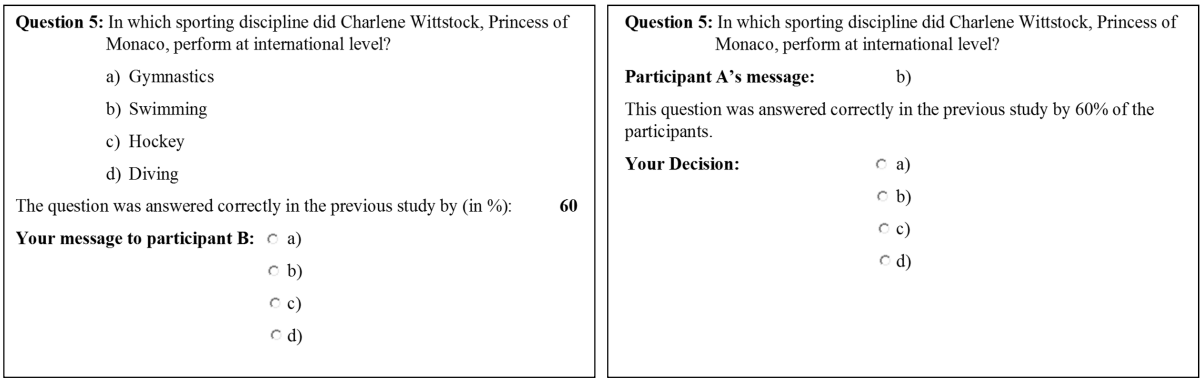

Fig. 2: Decision of sender and receiver in *signaling* treatments

Notes: The left figure shows the sender's decision and the right figure the receiver's decision. In the *no-signaling* treatments the sender's decision screen does not contain the four answer options, but the answer from the randomly selected participant from the pre-study. The receiver's screen is the same in all treatments.

After the choices (but before revelation of results) beliefs are elicited. Both senders and receivers are asked to indicate their belief about senders' and receivers' behavior. In the *signaling* treatments, subjects report their guess about the average number of correct messages and the average number of times receivers followed the message (out of the 15 questions averaged over all

[10]Given that the game is one-shot and players receive no feedback, the matching procedure should play no role.

senders respectively receivers). In the *no-signaling* treatments the corresponding belief question about senders' behavior is to guess the average number of messages equal to the random answer from the pre-study. In the *signaling* treatments, senders were additionally asked to voluntarily indicate how many correct answers (a) they knew and (b) they believe the other senders knew (both not-incentivized). The belief elicitation was not previously announced such that prior choices were not influenced. One of the two belief questions was randomly picked for payment. Subjects were paid 2 Euro in case their guess was equal or +/- 1 to the actual number and 2 Euros divided by the absolute estimation error if the estimate deviated by more than 1.

In part 3 I elicited the social status of information similar as in the pre-study.[11] In part 4, the expertise task, subjects answered 15 further questions of the same subject area as in their corresponding sender-receiver game (see for an overview of questions used Appendix Table A4 for *high* and Table A3 for *low*). Subjects were incentivized to answer correctly the questions and were paid 25 cents for each correct answer. In part 5 subjects answered a socio-demographics questionnaire that included questions on age, gender, nationality and school grades. At the very end of the experiments subjects were informed about the results. In the *signaling* treatments they learned the correct answer, the message, the receiver's action and their payoffs for each question. In the *signaling* treatments they learned the correct answer, the pre-study's answer, the message, the receiver's action and their payoffs for each question. The feedback was provided in a table. The questions and the answer options were not shown, but only the question numbers and labels (a, b, c, d for the correct answer, pre-study's answer and message).

I conducted a total of eight sessions in June and July 2015 and four pre-study sessions in June 2015. In the main experiment a total of 188 subjects participated, out of which 46 subjects participated in *signal-tabloid*, 48 in *signal-knowledge*, 48 in *no-signal-tabloid* and 46 in *no-signal-knowledge*. A session took on average 50 minutes and subjects earned 12.23 euros on average. In the pre-study, 96 subjects participated (48 in each question treatment) and their payment for the pre-study was on average 2.02 euros (in addition to the money they earned in the previous experiment). All sessions were conducted at the BonnEconLab, subjects were recruited via hroot (Bock et al., 2014) and the experiment was run using the experimental software z-Tree

[11] The procedure of the social status eliction was slightly adapted (see Appendix A.4.3). The evaluation of senders in the *signaling treatments* is qualitatively similar to the pre-study. The three characteristics that had significant differences at the highest significance level ($p < 0.01$) in the pre-study, extraversion, success and IQ, are qualitatively equivalent, but fail to reach significance. Aggregate measures as the average over all characteristics or a measure that controls for individual importance also rank *high* questions higher than the *low* questions, but equally fail to reach significance. Note that in the pre-study the prior task was non-strategic and more simple (earn money for correct answer). The strategic thinking induced in the experiment as well as a desire to maintain a positive self-image after lying may have reduced the treatment effect.

(Fischbacher, 2007).

4 Results

This section first reports results concerning the senders' behavior and receiver's behavior across the two treatment dimensions, the social status of subject area and signaling ability. Second, it shows results on the effect of difficulty.

Given that the information's precision depend on senders' background knowledge in the *signaling* treatments any analysis of truthful communication needs to take into account that subjects may have failed to acquire the correct answer to the question. This means that not all incorrect messages are necessarily intentional lies, but some are mistakes. Equivalently, correct messages contain intentional truthful messages of senders as well as unintentionally correct messages of senders who do not know the answer and send a correct message by chance. But since the difficulty level is on average identical across subject areas, I can direclty compare the share of correct messages between *low* and *high* in the *signaling* treatment.[12] Subjects have the same probability of not knowing the answer in both treatments.

As information is exogenously given in the *no-signaling* treatments, there is no need to take into account mistakes; messages directly reflect intentions. Senders decide whether they want to transmit ("follow") the answer from the pre-study or not. For a "follower", the probability to send a correct message is equal to the probability of receiving a correct answer, the share of correct answers, $P(C)$, in the pre-study. The probability of a non-follower to send a correct message is equal to $1/3\ (1 - P(C))$. If the sender receives an incorrect answer from the pre-study and does not follow the message, she has a chance of $1/3$ to unintentionally send a correct message. To compare the communication behavior across all treatments, I therefore use the variable *correct message* that is defined as follows. In the *signaling* treatments it takes the value of 1 if the message is equal to the correct answer and 0 if otherwise. In the *no-signaling* treatments it takes the value of $P(C)$ is the message is equal to the answer from the pre-study and $1/3\ (1 - P(C))$ if otherwise. Note that in both *signaling* and *no-signaling* treatments subjects have the same available technology to transmit a correct message on average. In *signaling*, senders can find out the correct answer to the question and send a truthful message; in *no-signaling*, senders can transmit the answer from the pre-study. Under truthful behavior, the average rate of correct messages should be the same in all treatments.

Figure 3 depicts the share of correct messages across all four treatments. The most salient

[12] This assumes that the average share of subjects who knows the correct answer is constant across pre-study and experiment or, weaker, that changes between pre-study and experiment are equivalent for both subject areas.

feature is that the share of correct messages in *signaling-high* is 14 percentage points higher than in *signaling-low*, senders are thus 43.75% more likely to send a correct message for *high* questions compared to *low* questions (MW, $p = 0.02$). Note that in both treatments the lying incentive is effective: the share of correct messages is significantly lower than the share of correct answers from the pre-study (MW, for both treatments $p < 0.01$). In *high* the rate is, nonetheless, above the 25% that a babbling strategy would produce (Wilcoxon signed-rank test, $p < 0.01$, WX henceforth), while the same is not true for *low* (WX, $p = 0.16$). The results suggest that only the general knowledge questions have a sufficiently high positive social status that provides social image and induces truth-telling.

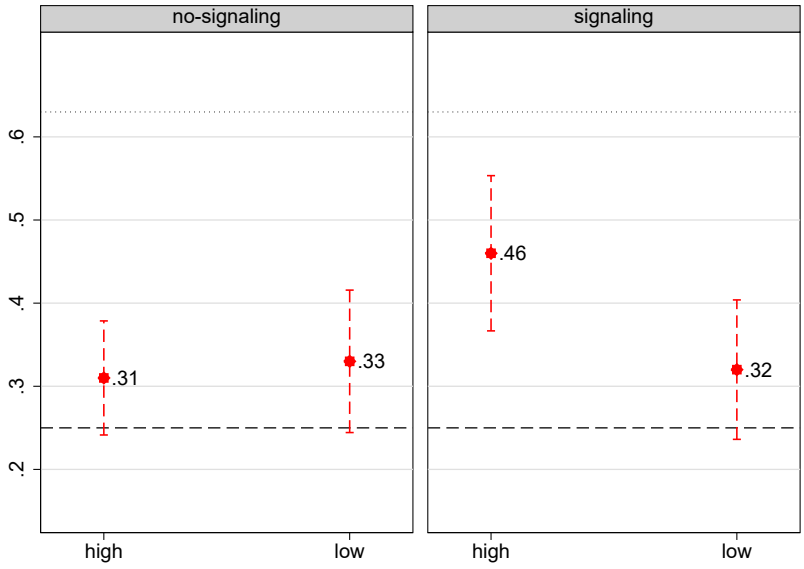

Fig. 3: Share of correct messages by treatments

Notes: A message is defined as correct if it is equal to the correct answer to the question. The vertical dashed red lines depict 95% confidence intervals. The horizontal dashed black line at 0.25 indicates the predicted rate of correct messages in a babbling equilibrium (benchmark case). The horizontal dotted black line at 0.63 depicts the share of correct answers in the pre-study.

In the *no-signaling* treatments I do not find any significant difference between *low* and *high* (MW, p=0.92). This reveals that the ability to show knowledge is crucial for the treatment difference to emerge: Transmitting information that depends on one's knowledge allows senders to signal expertise and derive positive image utility whenever the transmitted information has a high social status. The fact that the share of correct messages in *signaling-high* is significantly higher than in *no-signaling-high* (MW, p=0.02) is further evidence that the possibility to signal expertise in this area induces senders to tell the truth. For the low status subject area, *low*, I

do not find a statistically significant difference in messages (MW, $p = 0.96$), which reveals that tabloid questions do not induce senders to tell the truth even when they can signal expertise in this subject area.[13]

Result 1. *Subjects transmitting information on general knowledge questions send significantly more often correct messages compared to senders who receive questions on tabloid topics. Without the ability to signal knowledge, the treatment difference in communication disappears.*

Turning to the beliefs about senders' behavior in the *signaling* treatments, I find that senders mildly anticipated the treatment effect, albeit it fails statistical significance (MW, $p = 0.22$). On the receivers side the treatment effect was not anticipated (treatment comparison of receivers' belief in *low* vs. *high*, MW, $p > 0.39$). In the *no-signaling treatments* beliefs of senders and receivers do not differ across treatments, which is in line with the actual behavior of senders.[14]

How do receivers respond to the messages? Trust rates indicate the frequency of receivers to follow the senders' messages. In the *signaling* treatments, receivers in *high* trust in 36.31% of the messages, while in *low* up to 48.41%. The difference is not statistically significant (MW, $p = 0.39$).[15] In both treatments, trust rates are higher than in the benchmark babbling equilibrium (WX, $p = 0.08$ for *high* and $p = 0.004$ for *low*). Neither senders' nor receivers' beliefs about the average trust rate differ across treatments,[16] which is in line with their beliefs on senders' behavior where they neither anticipated the treatment effect. In the *no-signaling* treatments, trust rates are slightly higher, 51.30% in *high* and 55.60% in *low*. However, these differences are not statistically significant (neither within *no-signaling* treatments nor between *signaling* and *no-signaling* treatments). The belief and the trust data thus reveal that the strong treatment difference in the communication of senders in the *signaling* treatments was not anticipated. Consequently, it can be excluded that the treatment effect is driven by strategic considerations, e.g., senders being more honest because they expect receivers being more likely to mistrust them

[13] Given that the communication behavior is statistically not different from babbling in *no-signaling low* (WX, $p > 0.2$), it is not possible to detect a negative effect of social image, i.e., senders cannot increase their lying behavior beyond babbling. To examine the effect of negatively perceived information, one could use a setup with a lower misalignment of preferences that predicts partial pooling.

[14] In the *no-signaling treatments* treatments subjects were asked to indicate the average share of messages equal to the random answer from the pre-study. I therefore apply the same transformation as to the binary communication decisions. The belief about the average share of correct messages is equal to the belief about the average share of follower · average probability of correct answer from pre-study + (1−belief about average share of follower)·(1−average probability of correct answer from pre-study)·1/3.

[15] A random effects regression also finds no statistically significant difference between treatments.

[16] For an overview of all truth-telling and trusting rates (actual behavior and beliefs) see Table A5 for *signaling* and A6 for *no-signaling* treatments in Appendix.

(as it was previously observed in Sutter (2009) or Vanberg (2016)), but senders willingly give up money to signal their expertise.

Result 2. *The treatment difference in the truth-telling rates between transmitting knowledge on general knowledge questions and tabloid topics was not anticipated by senders nor receivers.*

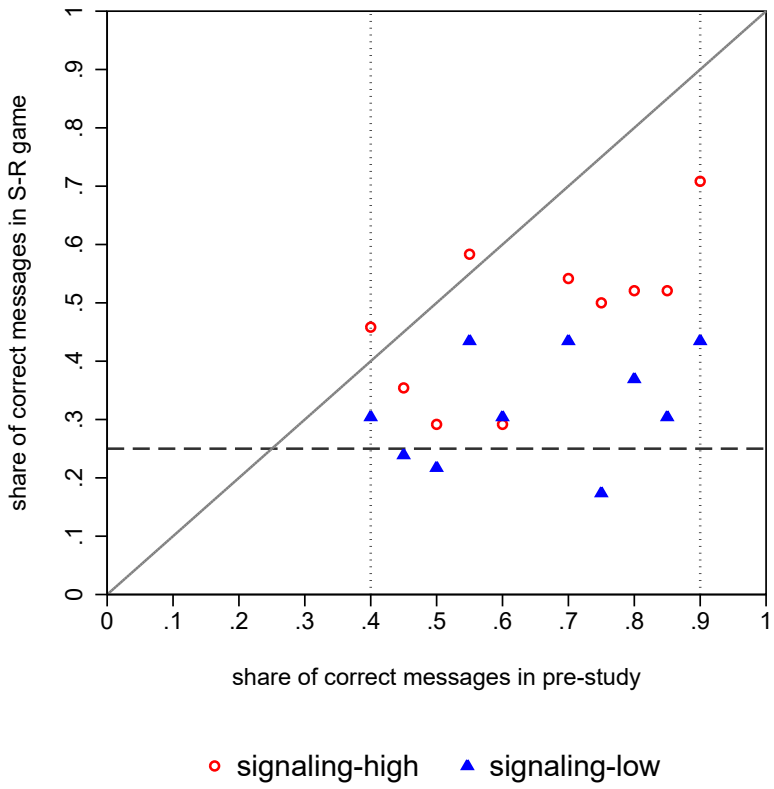

Fig. 4: Share of correct messages by degree of difficulty in *signaling*

Notes: The solid 45° degree line depicts the share of correct messages in the pre-study. The horizontal dashed line at 0.25 indicates the predicted rate of correct messages in a babbling equilibrium (standard benchmark). The dotted vertical lines at 0.4 and 0.9 indicate the boundaries of the difficulty interval which was used in the S-R game.

The previous results have shown that senders reacted on the higher social status of general knowledge questions and were more inclined to send correct messages. In the following, I analyze whether the difficulty of questions evoked an equivalent effect, i.e., whether senders lie less about more difficult questions. Figure 4 plots the share of correct messages in the sender-receiver (S-R) game in both *signaling* treatments conditional on the degree of difficulty (i.e., the share of correct messages in pre-study). Going from left to right on the x-axis means that the questions become easier and subjects have a higher a priori probability of finding the correct answer. The

figure shows that in both treatments the dots indicating the actual share of correct messages lie clearly below the solid 45° degree line, which indicates that senders send intentionally wrong answers. The increasing spread between the solid line and the dots may indicate that the more likely are senders to know the answer, the more likely are they to misreport it. Note, however, that not only an increasing, but also a constant lying rate (independent of the difficulty level) would produce this increasing spread.

To analyze the relationship of difficulty and truth-telling thoroughly, it is therefore useful to impose a statistically testable relationship. I assume that the probability of truth-telling in the experiment $P(T)$ is first and foremost a function of the easiness level of the question, the share of correctly answered questions in the pre-study $P(C)$. Senders can only make a deliberate choice about whether they want to tell the truth when they know the answer (as discussed in Section 2). Consequently, I assume that all other variables that presumably affect truth-telling behavior depend on the probability of knowing the correct answer (see Equation 1). The variables inside the parentheses capture these factors. β_0 is a constant, β_1 measures the effect of easiness ($P(C)$), β_2 the treatment effect of *low*, β_3 the treatment effect of *signaling* and β_4 the interaction effect of *low* and *signaling*. This regression setup has the following interpretation. If subjects behaved in the experiment as in the pre-study, the estimate for β_0 would be expected to equal 1, while all other coefficients would be 0.

Note that $P(C)$ enters the relationship twice, $P(C)$ outside parentheses controls for the effect of knowing the answer and $P(C)$ inside parentheses measures the social status effect of easiness, i.e., a correct answer to a more difficult questions may signal more expertise. For the regression analysis, I expand the function (see Equation 2). The regression includes random effects for subjects ϵ_i. The residual is ϵ_{it}.

$$\begin{aligned} P(T) = P(C)\big(&\beta_0 + \beta_1\ P(C) + \beta_2\ low + \beta_3\ signaling \\ &+ \beta_4\ signaling\ low\big) + \epsilon_i + \epsilon_{it} \end{aligned} \tag{1}$$

$$\begin{aligned} P(T) = \beta_0\ P(C) + \beta_1\ P(C)^2 + \beta_2\ low\ P(C) + \beta_3\ signaling\ P(C) \\ + \beta_4\ signaling\ low\ P(C) + \epsilon_i + \epsilon_{it} \end{aligned} \tag{2}$$

Table 3 reports two random effects estimations. Regression (1) includes all the variables listed above and Regression (2) additionally controls for the interaction of the *signaling* treatments and the difficulty level ($signal \cdot P(C)^2$).[17] In both regressions, the mechanical effect of

[17] Additional regressions include the score from the expertise test. Expertise is not significantly correlated with the number of correct messages in any of the *signaling* treatments. There is thus no indication for selection effects, i.e., individuals educated in general knowledge to be more likely to tell the truth than individuals competent in tabloid questions. Results are available upon request.

Table 3: Determinants of communication

	(1)	(2)
$P(C)$	0.73***	0.61***
	(0.11)	(0.15)
$P(C)^2$	-0.31***	-0.16
	(0.11)	(0.16)
$low \cdot P(C)$	-0.03	-0.03
	(0.08)	(0.08)
$signaling \cdot P(C)$	0.17**	0.40**
	(0.08)	(0.20)
$signaling \cdot low \cdot P(C)$	-0.20*	-0.20*
	(0.11)	(0.11)
$signaling \cdot P(C)^2$		-0.27
		(0.22)
Observations	1,301	1,301
Number of Subjects	94	94

Notes: This table reports coefficient of a linear random effects regression. $P(C)$ indicates the easiness of the question, i.e., the share of correct answers in the pre-study. All following variables are interacted with $P(C)$. The easiness level itself, $P(C)^2$, the treatment dummy *low* (taking the value of 1 for *low* and 0 otherwise), $low \cdot P(C)$, the treatment dummy *signaling* (taking the value of 1 for *signaling* and 0 otherwise), $signaling \cdot P(C)$, the interaction of both treatment dummies, $signaling \cdot low \cdot P(C)$, and the interaction of easiness with the treatment dummy *signaling*, $signaling \cdot P(C)^2$. Standard errors in parentheses. Significance levels: *** p<0.01, ** p<0.05, * p<0.1.

the difficulty level $P(C)$ is present, i.e., the easier the questions, the more likely senders know the correct answer and tell the truth. The negative coefficient of the squared term $P(C)^2$ in Regression (1) indicates that the rate of truth-telling is increasing in the difficulty of question. Regression (2) controls whether this effect depends on the signaling opportunity. Indeed, Regression (2) shows that this effect is not present in the *no-signaling* treatments, as the coefficient for $P(C)^2$ becomes insignificant. This is intuitive as senders cannot signal expertise in these treatments. As expected, the difficulty of questions matters in the *signaling* treatments: The sum of the coefficients $P(C)^2$ and $signal \cdot P(C)^2$ is statistically different from zero ($p < 0.01$). With knowledge-based information, senders care more about showing the receiver that they found the correct answer the more difficult a question is. Furthermore, the parametric analysis confirms all non-parametric results (see Regression 1). In the *signaling* treatments, senders in *low* are

less likely to tell the truth than in *high* (sum of $low \cdot P(C)$ and $signal \cdot low \cdot P(C)$ coefficients -0.23, $p < 0.01$). The subject area, as previously shown, does not matter for the *no-signaling* treatments (-0.03, $p > 0.1$). When senders transmit information on general knowledge questions, senders are more likely to tell the truth when information is endogenous compared to being exogenous (0.17, $p < 0.05$). This positive effect of endogenous information is not present for tabloid questions (sum of $signal \cdot P(C)$ and $signal \cdot low \cdot P(C)$ coefficients -0.03, $p > 0.1$).

Result 3. *Subjects are more likely to report correct messages when transmitting knowledge-based information from difficult compared to easy questions. Without the ability to signal knowledge, the difficulty effect disappears.*

5 Conclusion

This paper reports evidence on the effect of knowledge-based information in a sender-receiver game with misaligned interests. In the game the information's precision depends on sender's characteristics, i.e., her ability to extract the true state out of the given information. I demonstrate that senders communicating high status knowledge tell the truth significantly more often compared to senders in a treatment with low social status information. While in the low status treatment roughly half of all senders who know the correct answer report it truthfully, this share increases to more than 70% in the high status treatment. When senders can only transmit the knowledge from someone else, the treatment effect between subject areas disappears. Thus, the relevant driving factor is the possibility to signal the own expertise to the receiver.

In the experiment, I control for various factors, which outside of the laboratory would be difficult to achieve: (1) I use questions of the same difficulty level in both subject areas and reveal the difficulty level to senders as well as to receivers. In contrast, in reality both factors, social status and difficulty, are likely to correlate, or to be perceived to correlate (e.g., tabloid questions may be perceived to be easier than general knowledge questions). (2) In the experiment, the senders' communication has only consequences within the sender-receiver game; there is no room for reputation. In reality, however, many social interactions are repeated and non-anonymous. Thus, developing a reputation for being competent is valuable per se. In particular, expertise in tabloid and knowledge questions not only differs with regard to its social status but also most likely in the long-term reputational benefits. Revealing to others expertise in general knowledge may, for instance, increase one's reputation in a social network and thus one's career chances. In contrast, tabloid knowledge has little value for academic and most professional purposes. It might even signal self-control problems (e.g., reading online news instead of studying). Consequently, revealing expertise in high status areas compared to low status areas is presumably even more

beneficial in reality than in the laboratory.

While this paper finds only positive effects of knowledge-based information by inducing more senders to report truthfully in the high social status treatment, it is important to note that it may potentially also decrease truthful reporting (when individuals have an incentive to communicate truthfully). It can be expected that information which signals some type of misconduct or socially disapproved behavior would produce such a negative effect. For instance, a lobbyist may refrain from reporting her extensive knowledge on tax evasion opportunities to a government, as this information could evoke the image that she herself evades taxes.

More broadly, future research could further explore the role of social image concerns in transmitting and acquiring knowledge-based information. For instance, the decision to extract the relevant knowledge could be subject to strategic behavior if the information extraction process is costly, for example when solving an intelligence task or analyzing data (see for corresponding models of endogenous information acquisition Austen-Smith, 1994; Argenziano et al., 2016; Pei, 2015). Individuals may be inclined to put no effort in solving the task if expected image gains are not large enough to outweigh the effort costs. In this experiment a task with (nearly) no effort cost was chosen deliberately to exclude this effect.

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A Appendix

A.1 Pre-study

The pre-study was conducted after a completely unrelated individual decision-making experiment on time inconsistency in which subjects earned between 10 and 12.50 Euro. The pre-study consisted of three parts: (1) 50 questions, (2) belief elicitation about performance, (3) social status elicitation. English translations of all 50 questions can be found in Appendix A.2. For each correctly answered question they received a prize of 6 cent, in total up to 3 Euro. In the belief elicitation, subjects were asked to indicate their belief about their number of correctly answered questions. Subjects were paid 1 Euro in case their guess was equal or +/- 1 to the actual number of correct answers; and 1 Euros divided by the absolute estimation error if the estimate deviated by more than 1 answer. The social status elicitation consisted of two parts. On the first screen, subjects indicated how they assessed on average a person who is successful at answering the questions, on six different characteristics: intelligence, memory, success in studies and life, curiosity, openness for experiences and extraversion on a five-point Likert scale (image rating). On the second screen, subjects indicated the personal importance they attach to each characteristic (importance rating).

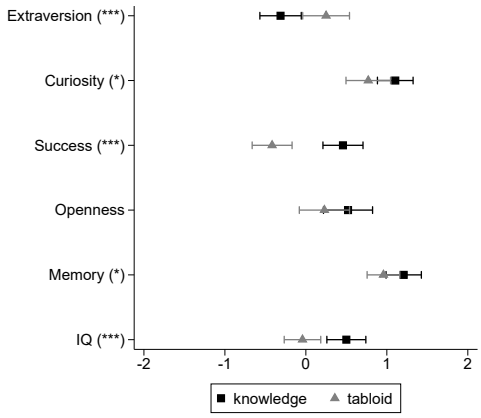

Fig. A1: Social status rating of each characteristic in pre-study

Notes: The vertical lines depict 95% confidence intervals. Answers on the 5-point Likert scale corresponded to "low", "rather low", "neutral", "rather high", "high". Significance levels (*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$) are indicated in parentheses. P-values of MW tests are as follows: IQ: $p = .003$, memory: $p = .072$, openness: $p = .243$, success: $p = .0$, curiosity: $p = .089$, extraversion: $p = .005$.

Figure A1 shows the image rating of the six characteristics in *high* and *low*. Figure A2 depicts the importance ratings of each characteristic. In terms of social image, there are statistically

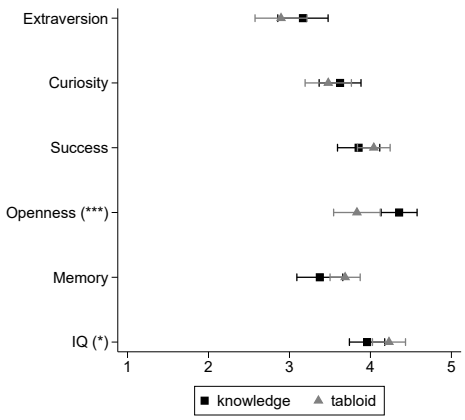

Fig. A2: Importance rating of each characteristic in pre-study

Notes: The vertical lines depict 95% confidence intervals. Answers on the 5-point Likert scale corresponded to "unimportant", "rather unimportant", "does not matter", "rather important", "important". Significance levels (*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$) are indicated in parentheses. P-values of MW tests are as follows: IQ: $p = .07$, memory: $p = .15$, openness: $p = .007$, success: $p = .405$, curiosity: $p = .619$, extraversion: $p = .187$.

significant differences in four out of six categories with extraversion being the only characteristic that is more highly evaluated in *low*. In terms of importance, there are only two significantly different evaluations. Additionally, I construct an aggregate measure that controls for the individual importance of each characteristic. Denote the first measure by $norm_{ij}$ for each subject i and characteristic j and the second measure imp_{ij}. Taken these two measures, I calculate a social status score for each subject $status_i = (\sum_{j=1}^{5} imp_{ij} * norm_{ij}) / \sum_{j=1}^{5} imp_{ij}$. It amounts to 0.61 in *high* and 0.27 in *low* (MW, $p = 0.0048$), which is a highly significant difference.

A.2 Multiple-Choice Questions

The tables A1 and A2 display all tabloid and knowledge questions used in the pre-study and the corresponding correct answers. Tables A3 and A4 display which of the questions were additionally used in the sender-receiver game and in the post-experimental questionnaire, provide summary statistics for each question (share of answers chosen in percent), and the easiness level (which was shown to the subjects in the sender-receiver game).

Table A1: Questions in *low*

#	Question	Answer a)	Answer b)	Answer c)	Answer d)	Correct
1	Which actor plays Bilbo Baggins in The Hobbit?	Elijah Wood	Benedict Cumberbatch	Morgan Freeman	Martin Freeman	d
2	Which national-team footballer recorded the song Gute Freunde kann niemand trennen in 1966?	Franz Beckenbauer	Sepp Maier	Uli Hoeneß	Gerd Müller	b
3	Which brand is associated with the slogan "Freude am Fahren"?	Mercedes	BMW	Audi	Porsche	b
4	In which country was Irina Shayk, the ex-girlfriend of football star Cristiano Ronaldo, born?	Brasil	Portugal	Ukraine	Russia	d
5	In which country did Carlsberg beer originate?	Czech Republic	Denmark	Germany	Great Britain	b
6	Which of these countries provides no filming location for the series Game of Thrones?	Israel	Croatia	Malta	Northern Ireland	a
7	Which family has reigned in the Principality of Monaco for many decades?	Chevrier	Grimaldi	Pegues	Rozier	b
8	In which sporting discipline did Charlene Wittstock, Princess of Monaco, perform at international level?	Gymnastics	Swimming	Hockey	Diving	b
9	Which country is the drink Pernod from?	Italy	Portugal	France	Greece	c
10	Which postcode is associated with Beverly Hills in the eponymous series?	80210	80212	90211	90210	d
11	Who hosted the programme Nur die Liebe zählt until 2011?	Oliver Geissen	Stefan Raab	Jörg Pilawa	Kai Pflaume	d
12	What is Alan Harper's profession in Two and a Half Men?	Tax consultant	Chiropractor	Policeman	Accountant	b
13	Which German TV channel broadcasts the programme Shopping Queen?	RTL2	SuperRTL	Vox	Sat1	c
14	Which band has a red tongue as its logo?	Status Quo	AC/DC	The Doors	The Rolling Stones	d
15	Who left the boy band Take That in 1995?	Gary Barlow	Mark Owen	Jason Orange	Robbie Williams	d
16	Which city hosts the programme ZDF-Fernsehgarten?	Cologne	Düsseldorf	Mainz	Wiesbaden	c
17	In which city do police inspectors Frank Thiel und Karl-Friedrich Boerne work, in the German Tatort crime series?	Constance (Konstanz)	Munich	Münster	Cologne	c
18	Which drink is also referred to as "green fairy"?	Tequila	Waldgeist	Absinth	Kiwi schnapps	c

19	Which bank is associated with the slogan "Wir machen den Weg frei"?	Dresdner Bank	Deutsche Bank	Sparkasse	Volksbanken Raiffeisenbanken	d
20	What is the name of Lady Gaga's debut album?	The Frame	The Fake	The Fame	The Flame	c
21	What is the name of the winner of the first Big Brother series?	Jürgen	Percy	Alida	John	d
22	Which German soap opera boasts the most episodes broadcast?	Marienhof	Verbotene Liebe	GZSZ	Unter Uns	c
23	What is the name of Nina Hagen's daughter?	Cosma Shiva	Cosima Banghli	Nadia Rashnee	Ghislaine	a
24	What is the name of the Munich discotheque that belongs to the Käfer dynasty?	Hippodrome	P1	Omen	Tresor	b
25	Who plays Joey in the series Friends?	Matthew Perry	Tate Donovan	David Schwimmer	Matt Le Blanc	d
26	With whom did Jan Böhmermann host the radio programme Sanft & Sorgfältig?	Klaas Heufer-Umlauf	Joachim Winterscheidt	Olli Schulz	Charlotte Roche	c
27	Who has killed a White Walker in the series Game of Thrones?	Tyrion Lannister	Brienne of Tarth	Samwell Tarly	Ned Stark	c
28	What is the name of the beer brand the Simpsons drink?	Budweiser	Duff	Miller	Guinness	b
29	What is the name of the starfish who is Spongebob's best friend in the eponymous cartoon?	Johnny	Patrick	Sandy	Taddäus	b
30	Which country is Justin Bieber from?	Great Britain	Australia	Canada	USA	c
31	Which is James Bond's favourite cocktail?	Martini	Bloody Mary	Manhattan	Margarita	a
32	Which animal can one see whenever the online service Twitter crashes?	Bear	Whale	Fox	Lion	b
33	How often was the actress Elizabeth Taylor married?	Seven times	Six times	Five times	Eight times	d
34	Who won the contest Germany's Next Topmodel in 2015?	Vanessa Fuchs	Stefanie Giesinger	Anuthida Ploypetch	Kim Hnizdo	a
35	Who hosted the final series of Deutschland sucht den Superstar?	Michelle Hunziker	Nazan Eckes	Dieter Bohlen	Oliver Geissen	d
36	What kind of animal is Hein Blöd in Käpt'n Blaubär (Captain Bluebear)?	Horse	Rat	Dog	Bear	b
37	Which animal was the Italian cartoon character Calimero?	Brown bear	Black tomcat	Blue mouse	Black chick	d
38	Which of these actors has yet to win an Oscar?	Johnny Depp	Leonardo di Caprio	Christoph Waltz	Sean Penn	a
39	In the series Friends, Ross marries three times. With whom was he never married?	Monica	Carol	Emily	Rachel	a
40	How many children do Brad Pitt and Angelina Jolie have?	7	6	4	5	b

41	Tom Cruise is a member of which religion?	Scientology	Buddhism	Jehovah's Witnesses	Judaism	a
42	With which US State is the whiskey brand Jack Daniels usually associated?	Mississippi	Alabama	Tennessee	Georgia	c
43	Which alcoholic drink is used in the preparation of a Daiquiri cocktail?	Rum	Gin	Whiskey	Vodka	a
44	Which country won the 2016 Eurovision Song Contest?	Ukraine	Russia	Aserbaidschan	Netherlands	a
45	In the year of which animal are we currently, according to the Chinese horoscope?	Dog	Monkey	Pig	Horse	b
46	What is associated with the following slogan: "Da weiß man, was man hat"?	Persil	Ariel	Meister Proper	Perwoll	a
47	What was Lady Diana's profession before she married Prince Charles?	Nurse	Teacher	Nursery school teacher	Secretary	c
48	Where might one drink a "Weiße mit Schuss"?	Munich	Berlin	Hamburg	Düsseldorf	b
49	Who won the Oscar in the Best Actor category in 2016?	Matt Damon	Michael Fassbender	Matthew McConaughey	Leonardo di Caprio	d
50	What is the son of Prince William and his wife Catherine called?	William	Philip	George	Harry	c

Table A2: Questions in *high*

#	Question	Answer a)	Answer b)	Answer c)	Answer d)	Correct
1	What is the name of the mathematician credited with a famous concept in game theory, named after him?	Carl Friedrich Gauss	Alan Turing	Bernard Bolzano	John Nash	d
2	What does "intrinsic" mean?	Cunning	Of one's own accord	Turned inwards	Dreamy	b
3	What does Grand Marnier taste of?	Orange	Fig	Plum	Apricot	a
4	Where is the Taunus mountain range situated?	Hesse & Rhineland-Palatinate	Bavaria & Baden-Württemberg	Thuringia & Saxony	Lower Saxony	a
5	Julian Assange fled to an embassy of which country?	Venezuela	Ecuador	Sweden	Russia	b
6	In which epoch was Lessing's Nathan the Wise published?	Classicism	Romanticism	Realism	Enlightenment	d
7	Which river flows into the Rhine in Mannheim?	Jagst	Moselle	Isar	Neckar	d
8	What is the highest mountain in the European Union?	Mont Blanc	Zugspitze	Matterhorn	Etna	a
9	Who elects the German Chancellor (Bundeskanzler)?	Federal Council (Bundesrat)	Bundestag	Federal Assembly, or Bundesversammlung	Federal Government	b
10	What is a dividend?	The price of a share	A share proportion one owns	Earnings per share	Profit distribution per share	d
11	How many degrees does the sum of all angles have in a triangle?	380°	360°	180°	90°	c
12	What is cardamom?	A city in Armenia	A spice	Llama wool	A hormone	b
13	Which of these mobile internet networks has the fastest potential transmission rate?	3G	LTE	GPRS	EDGE	b
14	Which of the following is a term from chaos theory?	Butterfly effect	Eagle effect	Seagull effect	Bumblebee effect	a
15	Which gemstone is green?	Opal	Ruby	Emerald	Sapphire	c
16	What is the largest island on earth?	Greenland	Neu Guinea	Madagascar	Sumatra	a
17	What is the correct spelling of the German word for "apparatus"?	Aparatur	Aperatur	Apparatur	Apperatur	c
18	In which country is a straw hat worn in such a way that it is possible to tell the wearer's life situation?	Panama	Venezuela	Tunisia	Marocco	a
19	What is the capital of Turkey?	Ankara	Istanbul	Izmir	Antalya	a
20	Which SIM card format does not exist?	Mini SIM	Small SIM	Micro SIM	Nano SIM	b
21	What is the name of the French blue cheese that is both blue and green and made from raw sheep's milk?	Bavaria Blu	Adelöst	Danablu	Roquefort	d

22	What is the name of the Greek doctor whose professional ethics still apply today?	Damocles	Hippocrates	Diogenes	Aristotle	b
23	Who discovered the sea route to India?	Christopher Columbus	Ferdinand Magellan	James Cook	Vasco da Gama	d
24	What does the Pearl Index calculate?	Purity of diamonds	Inequality of wealth	Reliability of contraceptive methods	Cleanliness of water	c
25	Which of these islands is not North Frisian?	Sylt	Amrum	Föhr	Norderney	d
26	Who is considered the founder of evolutionary theory?	Konrad Lorenz	Iwan Pawlow	Charles Darwin	Gregor Mendel	c
27	What is understood by the word "recession"?	Economic upturn	Economic high	Depression	Economic downturn	d
28	Who was President of France before François Hollande?	Laurent Fabius	Marine Le Pen	Nicolas Sarkozy	Jacques Chirac	c
29	What is known as "Trisomy 21"?	Haemophilia	Cystic fibrosis	Brittle bone disease	Down syndrome	d
30	What is the capital of Hesse?	Frankfurt	Düsseldorf	Darmstadt	Wiesbaden	d
31	Which element does not belong to the inert gases?	Neon	Helium	Ozone	Argon	c
32	Who was the first American President?	Lincoln	Washington	Roosevelt	Franklin	b
33	What is, roughly, the circumference of the Earth?	60,000 km	40,000 km	30,000 km	20,000 km	b
34	When was the German Reich founded?	1871	1866	1848	1933	a
35	Which of the following is not one of the Balearic Islands?	Mallorca	Tenerife	Menorca	Ibiza	b
36	Which country was ruled by Frederick the Great?	Austria	The German Reich	Russia	Prussia	d
37	What was not the name of one of Jesus' 12 apostles?	Thomas	John	Balthasar	Peter	c
38	Which German Chancellor was in office longest?	Gerhard Schröder	Helmut Schmidt	Konrad Adenauer	Helmut Kohl	d
39	In which country can Apulia be found?	Norway	France	Italy	Israel	c
40	Which is the smallest Bundesland in Germany?	Bavaria	Hamburg	Bremen	Saarland	c
41	What is a persiflage?	A French drink	A type of plant	A style of painting	Mockery	d
42	Who painted "The Scream"?	Vincent van Gogh	Edvard Munch	Leonardo da Vinci	Paul Gauguin	b
43	Which European country does not have the Euro?	France	Portugal	Sweden	Slovakia	c
44	Whom did George W. Bush defeat in the 2000 Presidential election?	John Kerry	Marco Rubio	Bill Clinton	Al Gore	d
45	Who served as Foreign Minister under Gerhard Schröder?	Jürgen Trittin	Joschka Fischer	Thomas Oppermann	Sigmar Gabriel	b
46	What is the Roman sign for 50?	L	M	X	V	a
47	Which of the following countries is not a founding member of the European Union?	Italy	Luxemburg	Spain	Netherlands	c

48	What was the name of the Austrian heir to the throne, whose murder triggered the First World War?	Wilhelm II.	Franz Ferdinand	Charles V, Duke of Lorraine	Otto von Bismarck	b
49	Who wrote the dystopian tale Brave New World?	Karl Marx	George Orwell	H. G. Wells	Aldous Huxley	d
50	Who wrote the novel Perfume?	Patrick Süskind	Franz Kafka	Thomas Mann	Hermann Hesse	a

Table A3: Summary statistics of questions in *low*

#	Question	Use	a) in %	b) in %	c) in %	d) in %	Easiness in %
1	hobbit	T	37.50	25.00	0.00	37.50	40
2	lied	T	18.75	29.17	12.50	39.58	40
3	freude	T	4.17	43.75	37.50	14.58	45
4	ronaldo	T	14.58	8.33	33.33	43.75	45
5	carlsberg	T	31.25	47.92	12.50	8.33	50
6	thrones	T	54.17	14.58	16.67	14.58	55
7	grimaldi	T	16.67	58.33	20.83	4.17	60
8	charlene	T	20.83	58.33	20.83	0.00	60
9	pernod	T	10.42	18.75	68.75	2.08	70
10	beverly	T	8.33	8.33	10.42	72.92	75
11	liebe	T	14.58	0.00	6.25	79.17	80
12	twohalf	T	6.25	81.25	0.00	12.50	80
13	shopping	T	8.33	4.17	83.33	4.17	85
14	band	T	4.17	8.33	2.08	85.42	85
15	boyband	T	4.17	4.17	2.08	89.58	90
16	zdf	P	12.50	14.58	60.42	12.50	
17	tatort	P	4.17	12.50	70.83	12.50	
18	fee	P	0.00	68.75	27.08	4.17	
19	weg	P	6.25	12.50	4.17	77.08	
20	gaga	P	6.25	2.08	91.67	0.00	
21	brother	P	54.17	10.42	20.83	14.58	
22	seifenoper	P	20.83	16.67	56.25	6.25	
23	hagen	P	85.42	4.17	6.25	4.17	
24	kaefer	P	6.25	70.83	10.42	12.50	
25	joey	P	25.00	22.92	20.83	31.25	
26	boehmermann	P	4.17	14.58	60.42	20.83	
27	walker	P	10.42	12.50	52.08	25.00	
28	simpsons	P	2.08	93.75	2.08	2.08	
29	spongebob	P	0.00	100.00	0.00	0.00	
30	bieber	P	2.08	0.00	85.42	12.50	
31	bond		95.83	2.08	0.00	2.08	
32	twitterq		22.92	45.83	25.00	6.25	

33	taylor	6.25	47.92	43.75	2.08
34	gntm	35.42	52.08	6.25	6.25
35	superstar	16.67	39.58	22.92	20.83
36	blaubaer	6.25	33.33	25.00	35.42
37	calimero	8.33	43.75	29.17	18.75
38	oscar	39.58	6.25	12.50	41.67
39	ross	33.33	16.67	22.92	27.08
40	kinder	25.00	27.08	16.67	31.25
41	religion	91.67	4.17	2.08	2.08
42	whiskey	2.08	10.42	85.42	2.08
43	daiquiri	27.08	35.42	4.17	33.33
44	eurovision	85.42	4.17	4.17	6.25
45	horoskop	18.75	41.67	25.00	14.58
46	waschmittel	33.33	29.17	18.75	18.75
47	diana	35.42	31.25	25.00	8.33
48	weisse	29.17	45.83	18.75	6.25
49	schauspieler	4.17	0.00	2.08	93.75
50	prinz	2.08	14.58	77.08	6.25

Notes: Abbrevations for use of questions are as follows: "T" means that question was used in the sender-receiver game in the treatment, "P" means that it was used as a post-experimental question. a), b), c) and d) in % indicates the percentage of answers for the corresponding answer item.

Table A4: Summary statistics of questions in *high*

#	Question	Use	a) in %	b) in %	c) in %	d) in %	Easiness in %
1	mathematiker	T	33.33	18.75	6.25	41.67	40
2	intrinsisch	T	12.50	41.67	39.58	6.25	40
3	marnier	T	43.75	16.67	14.58	25.00	45
4	taunus	T	43.75	14.58	33.33	8.33	45
5	assange	T	10.42	47.92	10.42	31.25	50
6	epoche	T	20.83	8.33	16.67	54.17	55
7	fluss	T	2.08	20.83	16.67	60.42	60
8	berg	T	58.33	25.00	14.58	2.08	60
9	bundeskanzler	T	22.92	68.75	4.17	4.17	70
10	dividende	T	0.00	6.25	20.83	72.92	75

11	winkelsumme	T	0.00	16.67	79.17	4.17	80
12	kardamon	T	4.17	79.17	10.42	6.25	80
13	internet	T	8.33	83.33	8.33	0.00	85
14	chaos	T	85.42	2.08	4.17	8.33	85
15	edelstein	T	6.25	0.00	87.50	6.25	90
16	insel	P	93.75	0.00	6.25	0.00	
17	apparatur	P	22.92	4.17	54.17	18.75	
18	strohhut	P	47.92	31.25	8.33	12.50	
19	tuerkei	P	68.75	29.17	0.00	2.08	
20	sim	P	8.33	85.42	2.08	4.17	
21	kaese	P	29.17	8.33	4.17	58.33	
22	eid	P	0.00	75.00	10.42	14.58	
23	seeweg	P	18.75	27.08	27.08	27.08	
24	pearl	P	25.00	37.50	14.58	22.92	
25	nordfriesland	P	29.17	29.17	10.42	31.25	
26	evolution	P	0.00	0.00	97.92	2.08	
27	rezession	P	10.42	2.08	16.67	70.83	
28	hollande	P	0.00	2.08	85.42	12.50	
29	trisomie	P	8.33	0.00	4.17	87.50	
30	hessen	P	27.08	2.08	10.42	60.42	
31	edelgas		12.50	6.25	64.58	16.67	
32	praesident		27.08	52.08	8.33	12.50	
33	erdumpfang		37.50	52.08	10.42	0.00	
34	dtreich		50.00	4.17	25.00	20.83	
35	balearen		8.33	62.50	4.17	25.00	
36	friedrich		8.33	16.67	4.17	70.83	
37	apostel		16.67	2.08	79.17	2.08	
38	amt		10.42	16.67	20.83	52.08	
39	apulien		14.58	6.25	66.67	12.50	
40	bundesland		2.08	20.83	50.00	27.08	
41	persiflage		4.17	4.17	27.08	64.58	
42	schrei		35.42	52.08	4.17	8.33	
43	land		0.00	4.17	81.25	14.58	
44	bush		20.83	0.00	27.08	52.08	
45	schroeder		8.33	64.58	14.58	12.50	

46	zeichen	54.17	39.58	2.08	4.17
47	eu	6.25	31.25	54.17	8.33
48	thronfolger	10.42	62.50	8.33	18.75
49	author	14.58	29.17	22.92	33.33
50	parfuem	62.50	12.50	14.58	10.42

Notes: Abbrevations for use of questions are as follows: "T" means that question was used in the sender-receiver game in the treatment, "P" means that it was used as a post-experimental question. a), b), c) and d) in % indicates the percentage of answers for the corresponding answer item.

A.3 Additional Tables

Table A5: Truth-telling and trust rates in *signaling*

	Truth-telling				Trust			
	High		Low		High		Low	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Actual rate	46.11	(0.23)	31.59	(0.21)	38.61	(0.33)	48.49	(0.33)
Senders' belief	41.39	(0.18)	33.33	(0.21)	45.28	(0.23)	37.97	(0.25)
Receiver's belief	31.94	(0.24)	39.13	(0.22)	40.28	(0.26)	40.29	(0.22)

Table A6: Truth-telling and trust rates in *no-signaling*

	Truth-telling				Trust			
	High		Low		High		Low	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Actual rate	30.91	(0.17)	33.17	(0.21)	51.3	(0.34)	55.56	(0.32)
Senders' belief	33.86	(0.12)	34.53	(0.12)	34.78	(0.2)	38.33	(0.23)
Receiver's belief	35.06	(0.13)	38.14	(0.12)	48.11	(0.27)	45.83	(0.28)

A.4 Instructions

This appendix presents paper instructions for the sender-receiver game used in the experiment A.4.1, the instructions for the social status elicitation in the pre-study A.4.2 and in the experiment A.4.3.

A.4.1 Instructions for Sender-Receiver Game with Endogenous Information

In the following a translation of the original German instructions is shown, first the instructions for the *signaling-low* treatment (denoted by TG in the left upper corner), then for the *no-signaling-low* treatment (denoted by UG).

The instructions for the *high* treatments only differ with regards to the question that was used in the example. The question in the *high* treatment reads as follows:
Who wrote the dystopian tale "Brave New World"?

(a) Karl Marx

(b) George Orwell

(c) H. G. Wells

(d) Aldous Huxley

A.4.2 Instructions for Social Status Elicitation in Pre-Study

These questions were presented on the participant's screen.

Screen 1

Please assess the significance of correct answers in the prior questions.
The table below depicts a list of characteristics.
Please indicate for each characteristic how you evaluate each one on average for people who score well on the prior questions. Choose between "low", "rather low", "neutral", "rather high", "high". Please choose as option the one you think is chosen by most participants.
... Intelligence quotient
... Memory
... Success in studies and life
... Curiosity
... Openness for new experiences
... Extroverted personality

Screen 2

How important do you find it that other people perceive you as someone with the following characteristics?

(unimportant – rather unimportant – does not matter – rather important – important)

... Intelligence quotient

... Memory

... Success in studies and life

... Curiosity

... Openness for new experiences

... Extroverted personality

A.4.3 Instructions for Social Status Elicitation in Experiment

To improve the clarity of the questions, some language changes were implemented in the experiment. The *importance* question from the pre-study was split up into two questions (perception of each characteristic and relative importance). One characteristic, conviviality, was added in the experiment. The first assessment question was incentivized as in Krupka and Weber (2013) and gave a prize of 2 Euro when the subject's answer matched the modal answer. One of the seven characteristics was randomly chosen for payment. In the pre-study subjects were told to indicate the answer that would be chosen by most subject. These questions were presented on the participant's screen.

Screen 1

The following table shows a list of characteristics. Please estimate for each of the characteristics the relationship between the number of correctly solved questions and the respective characteristic.

Choose whether you perceive the relationship as "negative", "slightly negative", "no connection", "weakly positive" or "positive". To indicate your answer, click on the appropriate box.

Example: Relationship between number of questions solved and health

1. A positive relationship exists when those who solved many questions correctly, are on average more healthy.

2. No relationship exists when those who solved many questions correctly, are on average not

particularly healthy nor particularly unhealthy.

3. A negative correlation exists when those who solved many questions correctly, are on average unhealthy.

At the end of the experiment, one of the characteristics will be randomly selected. For this characteristics we determine the option that was selected by most participants.

If you have chosen the same answer as most other participants, you will receive in addition to the other payments 2 Euro.

Relationship between number of questions solved and the following characteristics
... Intelligence quotient
... Memory
... Success in studies and life
... Curiosity
... Openness for new experiences
... Extroverted personality
... Conviviality

Screen 2

How do you feel it when you are perceived by others as someone with the following characteristics? (negative – rather negative – neutral – rather positive – positive)
... Intelligence quotient
... Memory
... Success in studies and life
... Curiosity
... Openness for new experiences
... Extroverted personality
... Conviviality

Screen 3

How important are these characteristics to you? You have 100 points. Please distribute these 100 points on the characteristics. The more important the particular characteristic is to you, the more points you should distribute to this characteristic.
... Intelligence quotient
... Memory

... Success in studies and life

... Curiosity

... Openness for new experiences

... Extroverted personality

... Conviviality