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Original Article

Enhanced Source Memory for Names of Cheaters

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Abstract: The present experiment shows that source memory for names associated with a history of cheating is better than source memory for names associated with irrelevant or trustworthy behavior, whereas old-new discrimination is not affected by whether a name was associated with cheating. This data pattern closely replicates findings obtained in previous experiments using facial stimuli, thus demonstrating that enhanced source memory for cheaters is not due to a cheater-detection module closely tied to the face processing system, but is rather due to a more general bias towards remembering the source of information associated with cheating.

Keywords: Social Contract Theory, cheater detection, context memory, reciprocal altruism, cooperation

Introduction

A popular assumption in evolutionary psychology is that the human cognitive architecture is composed of highly specialized modules that have evolved to solve specific adaptive problems. A prominent example is the cheater-detection module postulated by social contract theory (Cosmides, 1989; Cosmides and Tooby, 1992, 2005). According to this theory, social cooperation is beneficial because individuals can increase their fitness by cooperating with each other. However, cooperation also carries the risk of exploitation. Therefore, it is assumed that cooperation cannot evolve or be stably maintained in a group unless humans have evolved specialized brain mechanisms that help them to avoid exploitation by cheaters. The cheater-detection module postulated by social contract theory serves this end by allowing the individual to quickly and easily draw inferences about whether someone has cheated in prior exchanges or is about to cheat in future interactions.

A strategy to avoid being exploited by cheaters simply consists of refusing to cooperate with individuals who are known to have cheated previously (reciprocal altruism;

Axelrod and Hamilton, 1981; Trivers, 1971). This requires good memory for cheaters in addition to cheater detection. More specifically, it has been suggested that the ability to recognize faces of cheaters is an important prerequisite for a reciprocal strategy in social exchange (Mealey, Daood, and Krage, 1996; Oda, 1997). Seemingly consistent with these assumptions, Mealey et al. reported that for faces associated with low-status professions, old-new discrimination was better for faces associated with descriptions of cheating than for faces associated with trustworthy behavior. However, this finding has turned out to be difficult to replicate in studies that differed from the original Mealey et al. study in that they used very carefully controlled materials (Barclay and Lalumière, 2006; Mehl and Buchner, 2008). Even in the original Mealey et al. study, the pattern observed for the low-status professions was not replicated when high-status professions were used. On its own, this is not necessarily inconsistent with an evolutionary point of view, because increased familiarity for faces of cheaters without context information might even increase the risk of exploitation because of the preference often exhibited towards familiar stimuli (Bornstein, 1989). In contrast, source memory for faces of cheaters, that is, memory for the cheating context in which a face was encountered, can help to avoid cheaters and can therefore provide an evolutionary benefit. Indeed, recent evidence suggests that source memory for faces of cheaters is enhanced in comparison to source memory for other types of faces (Buchner, Bell, Mehl, and Musch, 2009; Chiappe et al., 2004).

Based on these results, we now turn to the next research question that suggested itself given the hypotheses suggested by Mealey et al. (1996). Specifically, it has been proposed that the memory advantage for faces of cheaters may be due to "specialized adaptive features […] built into the individual face recognition system" (p. 120). This suggestion fits with the trend in evolutionary psychology to attribute human behavior to specialized modules that are distinctive in terms of their processing mechanisms and their contents. However, this hypothesis should not be accepted unless it is tested empirically.

The present experiment was designed to test the hypothesis that the effect of the behavioral history on source memory is restricted to facial stimuli. The experiment is an exact replication of Experiment 2 reported by Buchner et al. (2009), with the only exception that names instead of faces were used. In an exposition phase, participants saw names that were presented together with short descriptions of cheating, trustworthy, or irrelevant behavior. In a test phase, previously seen and new names were judged as old or new. If a name was judged as old, participants indicated whether they thought that the name had previously been associated with a history of cheating, with a history of trustworthiness, or with neither of these. Our basic hypothesis was that if the effect of the behavioral-history variable on memory was indeed due to a feature of the human face-processing system, as assumed by Mealey et al. (1996), then the source memory advantage for cheaters should vanish when names instead of faces are used as stimuli. If the underlying mechanism were more general and not restricted to the processing of faces, we would expect a close replication of the results obtained with faces, namely identical old-new discrimination for names associated with either type of behavior, but better source memory for names associated with cheating than for other types of names.

Materials and Methods

Participants

Participants were 111 women and 82 men, most of whom were students at the Heinrich-Heine-University Düsseldorf. They were paid for participating. Their age ranged from 18 to 52 years (M = 25, SD = 5.3).

Apparatus and Materials

A total of 72 common male first names were randomly assigned to two sets of 36 names each (henceforth Sets 1 and 2). Brief descriptions typed below the names conveyed the behavioral history of the stimulus person (cheating, irrelevant to the cheating-trustworthiness dimension, trustworthy). To guarantee the comparability of the present results and the results obtained with facial stimuli, the same behavior descriptions were used as in Buchner et al.'s (2009) Experiments 1-3. The descriptions included information about the depicted person's profession. As in Buchner et al.'s Experiments 1-3, only low-status professions were used. Note that this seems justified given that Buchner et al. found that status did not modulate the source memory advantage for cheaters. For instance, "He is a used-car dealer. He regularly sells restored crash cars as supposedly accident-free and conceals serious defects from the customers." would convey a history of cheating. "He is a scaffolder. Presently, he works at a building site in southern Germany where several tenements and office buildings are to be built." would convey behavior that is irrelevant to the cheating-trustworthiness dimension. "He is a cheese monger. He strongly attends to sorting out old cheese immediately and allows his customers to try all his products." would convey trustworthy behavior. In German, all sentences were 21 words long.

Information about the social status of the professions and the valence of the descriptions was obtained in independent norming studies. In one norming study, participants (N = 36) rated 200 job titles with respect to their social status using a scale ranging from 1 (low status) to 5 (high status). A total of 36 job titles with low ratings were chosen for the experiment (M = 1.88, SD = .33). A different group of participants (N = 22) rated the valence of 72 behavior descriptions to make sure that instances of cheating, irrelevant, and trustworthy behavior were perceived as negative, neutral, and positive, respectively. Valence was assessed on a scale ranging from -3 ("negative") to +3 ("positive"). Finally, 12 sentences were selected for each of the three types of descriptions (cheating, irrelevant, trustworthy). Mean valence was -2.50 for the descriptions of cheating (SD = 0.51), 0.25 for the descriptions of irrelevant behavior (SD = 0.59), and 2.32 for the descriptions of trustworthiness (SD = 0.74). In terms of absolute valence (i.e., ignoring the minus sign for the descriptions of cheating), an item-based analysis showed that there was a large difference between descriptions of cheating and descriptions of irrelevant behavior, $t(22) = 15.25$, $p < .001$, $\eta^2 = .91$, and between descriptions of trustworthiness and descriptions of irrelevant behavior, $t(22) = 25.22$, $p < .001$, $\eta^2 = .97$, whereas descriptions of cheating and descriptions of trustworthiness did not differ, $t(22) = 1.12$, $p = .27$, $\eta^2 = .05$. Names and descriptions were combined randomly for each participant.

Procedure

Participants were tested individually. They were asked to rate the likability of 36 stimulus persons. Each trial started with a headline ("How likable do you find this person?") and a name (Set 1 or 2, counterbalanced across participants). The behavior description was shown 2 s later, followed 4.5 s later by the likability rating scale (ranging from 1, "not likable at all", to 6, "extremely likable"). Participants rated the likability using the computer mouse and initiated the next trial. The names were presented in random order.

As in Buchner et al.'s (2009) Experiments 1, 2, and 4, the exposition phase was immediately followed by a test phase in which participants saw a random sequence of 72 names, half of which had been presented in the first phase (Set 1 or 2) and half were new (Set 2 or 1). Each trial started with a headline ("How likable do you find this person?") and a name. The likability rating scale appeared 1.5 s later. After the rating a new headline appeared ("Is this name old or new?"), followed by an "old" and a "new" checkbox, one of which participants selected depending on whether they thought that they had seen the name during the exposition phase or not. Following an "old" judgment and a click on the continue button, checkboxes labeled "cheating", "trustworthy", and "neither cheating nor trustworthy" appeared, which participants used to judge the behavior that was used in the description accompanying that name in the exposition phase. After selecting one of these checkboxes and then clicking the continue button the next trial was started.

Design

The within-subject independent variable was behavioral history (cheating, irrelevant, trustworthy). The dependent measures were likability ratings, old-new discrimination in terms of the sensitivity measure of the two-high threshold model of signal detection, P_r, and source judgments given an "old" judgment.

Given a sample size of N = 193, α = .05, and the assumption that the average population correlation between the levels of the behavioral-history variable for the old-new discrimination sensitivity measure is $\rho = .55$ (estimated from pilot data), effects of size f = 0.11 (that is, between small [f = 0.10] and medium [f = 0.25] effects as defined by Cohen, 1988) could be detected for this variable with a probability of $1 - \beta = .95$. The power calculation was conducted using G•Power (Faul, Erdfelder, Lang, and Buchner, 2007). A multivariate approach was used for all within-subject comparisons. In the present application, all multivariate test criteria correspond to the same (exact) F-statistic, which is reported. Partial η^2 is reported as an effect-size measure. The level of α was set to .05.

Results

Exposition-phase likability ratings

Exposition-phase likability ratings differed as a function of the behavioral-history variable, $F(2,191) = 1145.70$, $p < .001$, $\eta^2 = .92$. Orthogonal contrasts showed that cheaters were less likable than other persons, $F(1,192) = 2082.71$, $p < .001$, $\eta^2 = .92$, and that trustworthy persons were more likable than persons associated with irrelevant behavior, $F(1,192) = 933.11$, $p < .001$, $\eta^2 = .83$. Mean exposition-phase likability was 1.77 for persons associated with cheating (SE = 0.03), 3.79 for persons associated with irrelevant behavior (SE = 0.04), and 4.93 for persons associated with trustworthy behavior (SE = 0.04). The results show that the behavior descriptions were attended and processed, a necessary precondition for analyzing subsequent effects of the descriptions.

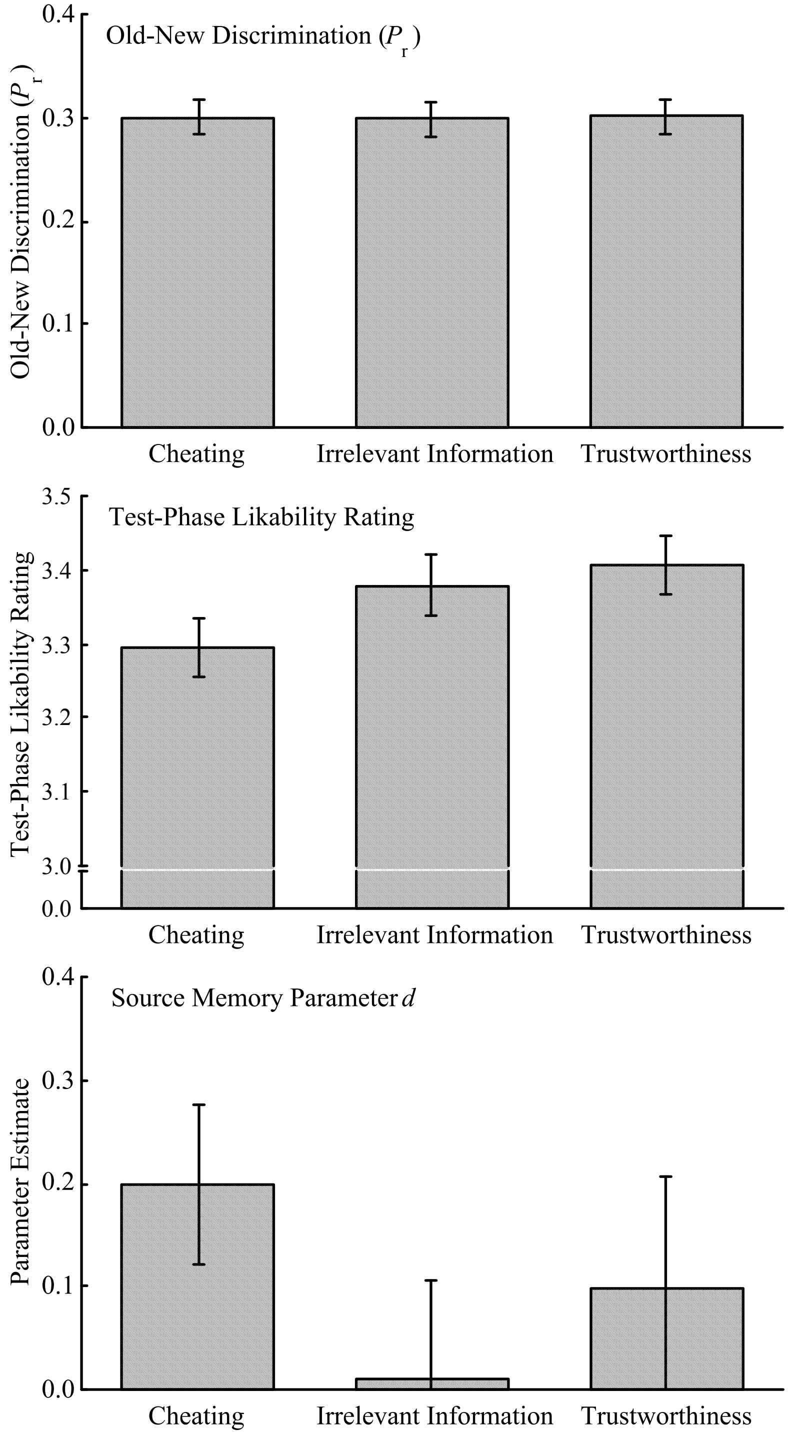
Old-new discrimination

The upper panel in Figure 1 displays old-new discrimination in terms of P_r (the sensitivity measure of the two-high threshold model), which is calculated by subtracting the false alarm rate (FA) from the hit rate (H), $P_r = H - FA$. We report P_r as a sensitivity measure because it was favorably evaluated in validation studies (Snodgrass and Corwin, 1988) and avoids the problem of undefined values that comes with using *d*'. Old-new discrimination did not differ as a function of behavioral history, $F(2,191) = 0.01$, $p = .99$, $\eta^2 < 01$. Thus, replicating results of studies using facial stimuli (Buchner et al., 2009; Mehl and Buchner, 2008), there was no effect of the behavior descriptions on old-new discrimination despite the powerful effects of these descriptions on exposition-phase likability ratings.

Test-phase likability ratings

The main effect of behavioral history on test-phase likability ratings (Figure 1) was significant $F(2,191) = 6.78$, $p < .001$, $\eta^2 = .07$. Names associated with cheating were less likable than other names, $F(1,192) = 12.43$, $p < .001$, $\eta^2 = .06$, whereas likability did not differ between names associated with irrelevant behavior and names associated with trustworthy behavior, $F(1,192) = 0.71$, $p = .40$, $\eta^2 < .01$. In other words, the effect of the behavioral-history variable on test-phase likability ratings obtained in experiments using facial stimuli (Buchner et al., 2009) was replicated. The decreased test-phase likability ratings of names that were previously associated with cheating may reflect participants' memory for the behavior associated with the names, which may translate into a negative reaction toward these names.

Figure 1. Memory measures and test-phase likability ratings as a function of the behavior descriptions.



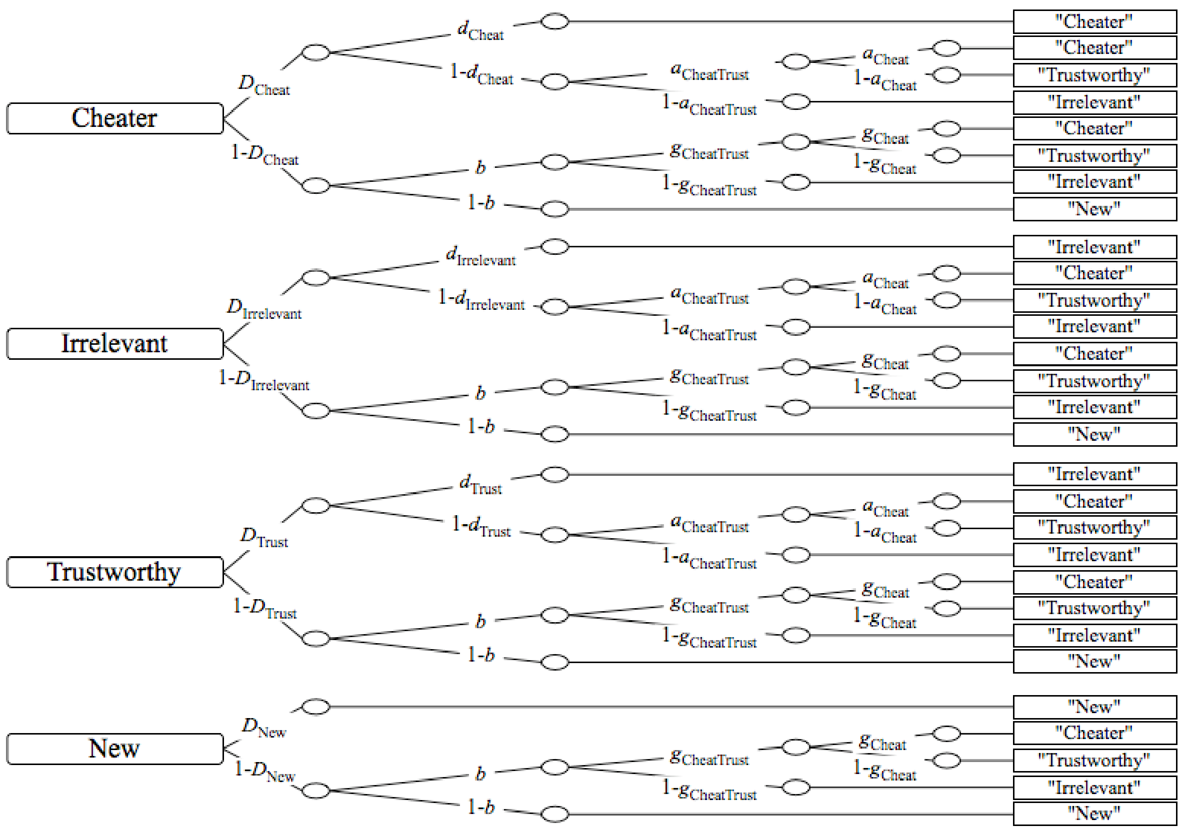
Upper panel: Old-new discrimination in terms of the sensitivity measure of the two-high threshold model, P_r. Error bars represent the standard errors of the means. *Center panel*: Test-phase likability ratings on a scale from 1 (“not likable at all”) to 6 (“extremely likable"). Error bars represent the standard errors of the means. *Lower panel*: Parameter estimates for the source memory parameters for names associated with a history of cheating (d_{Cheat}), for names associated with irrelevant information ($d_{\text{Irrelevant}}$), and for names associated with a history of trustworthiness (d_{Trust}). Error bars represent the .95 confidence intervals.

Source memory

The most interesting dependent variable in the present context is participants' source memory, that is, their memory for the context in which a name was encountered. A problem when measuring memory for source is which measurement tool to use. Early approaches relied on ad-hoc measures of source memory, which are problematic because they confound source memory with old-new discrimination and guessing processes (Bröder and Meiser, 2007; Murnane and Bayen, 1996). Fortunately, alternative measurement tools exist in terms of multinomial models of source memory (Batchelder and Riefer, 1990; Bayen, Murnane, and Erdfelder, 1996), which are to be preferred over more conventional approaches because they allow for the independent measurement of old-new discrimination, source memory, and various types of response biases. We therefore analyzed the source memory data using the multinomial source memory model developed and validated by Bayen, Murnane, and Erdfelder (1996), which has been used successfully in a number of experiments (e.g., Bayen, Nakamura, Dupuis, and Yang, 2000; Bell, Buchner, and Mund, 2008; D'Argembeau and Van der Linden, 2004; Doerksen and Shimamura, 2001; Spaniol and Bayen, 2002). An adaptation of the model for the present purposes is presented in Figure 2.

The model displayed in Figure 2 contains twelve free parameters, each of which represents the probability with which certain cognitive processes occur. To illustrate, parameter D_{Cheat} represents the probability of recognizing a cheater name as old. Parameter d_{Cheat} represents the conditional probability of also remembering correctly that a recognized name was encountered in the context of a history-of-cheating description. If the source of a correctly recognized cheater name is not known (with probability $1 - d_{\text{Cheat}}$), it may be guessed correctly that the name belongs to a cheater with probability $a_{\text{CheatTrust}} \cdot a_{\text{Cheat}}$. Alternatively, it may be guessed incorrectly that the name is that of a trustworthy person with probability $a_{\text{CheatTrust}} \cdot (1 - a_{\text{Cheat}})$ or that the name is that of a person described as neither cheating nor trustworthy with probability $(1 - a_{\text{CheatTrust}})$. If a cheater name from the exposition phase is not correctly recognized as old (with probability $1 - D_{\text{Cheat}}$), it may still be guessed, with probability b, that the name is old. For these cheater names, the correct source may be guessed with probability $g_{\text{CheatTrust}} \cdot g_{\text{Cheat}}$. Alternatively, it may be guessed incorrectly that the name belongs to a trustworthy person with probability $g_{\text{CheatTrust}} \cdot (1 - g_{\text{Cheat}})$ or to a person described as neither cheating nor trustworthy with probability $(1 - g_{\text{CheatTrust}})$. The final branch in this tree of the model concerns cheater names that are neither recognized as old (with probability $1 - D_{\text{Cheat}}$) nor guessed to be old (with probability $1 - b$), which are incorrectly judged to be new. Analogous considerations hold for the model trees for names associated with trustworthy descriptions, names associated with a context that is irrelevant to the cheating-trustworthiness dimension, and for new names.

Figure 2. Bayen et al.'s (1996) source memory model as adapted for the present purposes.



Rounded rectangles on the left side represent the types of names presented. Letters along the links represent the probabilities with which certain cognitive processes occur (*D*.: probability of identifying correctly a name as old or new; *d*.: source memory in the sense of remembering the context of a name that was detected as old; *b*: probability of guessing that a non-recognized name is old; $a_{CheatTrust}$, a_{Cheat}: probability of guessing that a recognized name for which the source was not remembered was encountered in a certain context; $g_{CheatTrust}$, g_{Cheat}: probability of guessing that a non-recognized name that was classified as old on the basis of guessing was encountered in a certain context). Rectangles on the right side represent the categories of participants' judgments.

As an illustration of the utility of such a model consider, for instance, the names associated with cheating receiving "cheater" responses. These responses may be arrived at either by recognizing the name as old and remembering its source (with probability $D_{Cheat} \cdot d_{Cheat}$), by recognizing the name as old and guessing its source (with probability $D_{Cheat} \cdot (1 - d_{Cheat}) \cdot a_{CheatTrust} \cdot a_{Cheat}$), or by guessing that the name is old and guessing its source (with probability $(1 - D_{Cheat}) \cdot b \cdot g_{CheatTrust} \cdot g_{Cheat}$). Thus, the probability of a cheater name receiving a "cheater" response is given by $D_{Cheat} \cdot d_{Cheat} + D_{Cheat} \cdot (1 - d_{Cheat}) \cdot a_{CheatTrust} \cdot a_{Cheat} + (1 - D_{Cheat}) \cdot b \cdot g_{CheatTrust} \cdot g_{Cheat}$. Analogous model equations may be written for all other combinations of name types and response categories. Based on these model equations and the empirically observed sample responses to the different types of names, it is possible to decompose the set of processes involved in participants' responses and to estimate the probabilities associated with the model parameters representing these processes using standard computer programs (Rothkegel, 1999; Stahl and Klauer, 2007).

Furthermore, statistical tests can be performed directly on the model parameters. In order to simplify our analysis, we decided to begin with a base model (henceforth Base Model 1) that builds on the result that old-new discrimination did not differ as a function of the behavioral-history variable. We thus decided for Base Model 1 to set all parameters to be equal that represent the probability of recognizing a name from the exposition phase as old, that is, $D_{\text{Cheat}} = D_{\text{Irrelevant}} = D_{\text{Trust}}$. Based on the well-known mirror effect (Glanzer, Adams, Iverson, and Kim, 1993), we also set the parameter representing the probability of detecting new names as new (D_{New}) to be equal to the recognition parameters so that Base Model 1 is characterized by the general restriction that $D_{\text{Cheat}} = D_{\text{Irrelevant}} = D_{\text{Trust}} = D_{\text{New}}$. These restrictions imply the assumption that the recognition of the names was independent of whether they were presented as names of cheaters, of irrelevant persons, or of trustworthy persons. This assumption is justified if the model that implements these restrictions is compatible with the data. Otherwise, that is, in case of a statistically significant misfit of the restricted model, the assumption has to be rejected.

The goodness of fit of Base Model 1 is determined by comparing the empirically observed category frequencies with the frequencies that are predicted by the model. The goodness-of-fit statistic G^2 is asymptotically χ^2 distributed with three degrees of freedom. A p value smaller than .05 would indicate that the implemented restrictions are not compatible with the data, as a result of which the hypotheses implicated by the parameter restrictions would have to be rejected. However, the model with the restriction that all name recognition parameters are equal (i.e., Base Model 1) fits the data very well, $G^2(3) = 2.90$, $p = .41$. This mirrors the old-new discrimination results reported above.

Next, we tested whether source memory differed between names of trustworthy persons and names of irrelevant persons. In terms of model parameters, the null hypothesis that there is no such difference can be implemented directly by imposing, on Base Model 1, the restriction that $d_{\text{Trust}} = d_{\text{Irrelevant}}$. This restriction generates one degree of freedom in addition to the three degrees of freedom of Base Model 1. The corresponding increase in the model misfit as expressed in the goodness-of-fit statistic, ΔG^2, is asymptotically χ^2 distributed with one degree of freedom. The restriction was compatible with the data, $\Delta G^2(1) = 1.03$, $p = .31$, forcing us to conclude that source memory did not differ as a function of whether the name belonged to a trustworthy or to an irrelevant person. The set of restrictions applied so far are combined into Base Model 2, which, as expected, also fitted the data very well, $G^2(4) = 3.93$, $p = .42$.

Finally, we tested whether source memory for names associated with cheating was better than source memory for names associated with trustworthy or irrelevant descriptions. At a descriptive level this appears to be the case, as can be seen in the lower panel of Figure 1. In terms of model parameters, the null hypothesis that there is no such difference can be implemented directly by imposing, on Base Model 2, the restriction that $d_{\text{Cheat}} = d_{\text{Trust}} = d_{\text{Irrelevant}}$. The restriction was not compatible with the data, $\Delta G^2(1) = 7.49$, $p < .01$, forcing us to conclude that source memory for names of cheaters was indeed better than source memory for other types of names.

Note that the memory parameters observed in the present experiment are somewhat lower than the memory parameters observed by Buchner et al. (2009). However, the absolute magnitude of the memory parameters can be influenced by a large number of experiment-specific variables such as the homogeneity of the test stimuli. It thus does not have a unique interpretation. Therefore, the most important aspect of the present findings is that the pattern of the results reported by Buchner et al. (2009) was replicated. Specifically, the source memory parameters here and in Buchner et al. (2009) show nearly identical patterns in that source memory is best for cheaters, intermediate for trustworthy characters, and worst for characters that were described as neither cheating nor trustworthy.

Discussion

The results of the present experiment using names as stimuli very closely replicate the results obtained in earlier experiments in which facial stimuli were used (Buchner et al., 2009). Old-new discrimination of names does not differ as a function of whether names were originally associated with cheating, irrelevant behavior, or trustworthiness. In contrast, source memory for names associated with a history of cheating was better than for other types of names. This finding was corroborated by the result that names associated with cheating were rated less likable than other names. This may reflect participants' memory for the behavior associated with the name. Such a negative reaction may help avoiding costly social exchanges with cheaters.

The fact that the same results were observed regardless of whether names or faces were used as stimulus material strongly argues against the hypothesis of Mealey et al. (1996) and others (e.g., Oda, 1997) that enhanced memory for cheaters is due to a specialized cheater-identification module closely tied to the face processing system. Rather, the results suggests that the enhanced source memory for faces of cheaters observed earlier (Buchner et al., 2009; Chiappe et al., 2004) is due to more general mechanisms that serve to increase the probability that the cheating context is remembered regardless of whether it is paired with a face or a name.

Obviously, it can be adaptive to have good source memory for names of cheaters, because it could help to avoid cheaters in social encounters. Models of indirect reciprocity (Nowak and Sigmund, 2005) postulate that social exchanges between third parties are a valuable source of information about potential exchange partners (see also Dunbar, 2004; Enquist and Leimar, 1993; Wilson, Wilczynski, Wells, and Weiser, 2000), because a person's behavior in previous social interactions may be predictive of the behavior of that person in future interactions. It might be more helpful to focus on cheating rather than on cooperation because cooperation is less diagnostic than cheating due to the fact that even selfish individuals may cooperate if they can benefit from cooperation directly. Therefore, it may be beneficial for individuals to focus on the names of persons that have cheated, because this enables them to avoid exploitation by these individuals in future encounters. Given the relative ease of spreading information about reputations associated with names, these memory biases may also play an important role in the establishment and maintenance of social norms in groups and societies. When cooperators consistently refuse to interact with individuals who are known to have cheated in interactions with third parties, cheating is punished indirectly. Consistent with this assumption, the rate of cheating decreases when the individuals are able to share information about who has cheated and who has cooperated in previous encounters (Nowak and Sigmund, 2005). Thus, remembering that a name belongs to a cheater has clear fitness advantages. It is obvious that the evolutionary benefit of a more general mechanism that serves to enhance source memory for information that is presented in a context of cheating regardless of whether it is a face or a name may be much larger than the benefit of a mechanism that is limited to memory for faces alone.

Although the data presented here clearly demonstrate that the mechanisms leading to enhanced source memory for cheaters are not face-specific, these results are still consistent with the assumption that these mechanisms are "domain-specific" in that the source memory advantage may be confined to information about the violation of social-contract rules. Recently, Farrelly and Turnbull (2008) provided evidence in support of the hypothesis that memory for cheaters might be "special" by showing that participants remembered faces previously associated with a violation (or adherence) of a social-contract rule better than faces previously associated with a violation (or adherence) of a precautionary rule. Poh and Fiddick (2008) found a similar dissociation.

However, there are also studies suggesting that the source memory advantage for cheaters can be attributed to more general mechanisms. Barclay (2008) showed that rarity within an experiment can modulate memory for cheaters. Based on this finding, one could argue that behavior that is in accordance with moral standards that are prevalent in the society is more common than behavior that violates social norms. Cheating behavior could thus be considered exceptional behavior and as such could be more distinct and hence more memorable than trustworthy behavior (Schmidt, 1991). However, this explanation is unlikely to account for the present results because the source memory advantage observed by Buchner et al. (2009) was found to be unrelated to the degree to which the behavior descriptions were exceptional.

Another interesting question is whether the source memory advantage for cheaters may be due to the valence of the behavior descriptions. Episodes of cheating and norm breaking stimulate strong negative emotions such as anger (e.g., Wilson and O'Gorman, 2003). Such negative emotions may play a crucial role in mobilizing attentional resources that stimulate encoding and retrieval of context information in general (D'Argembeau and Van der Linden, 2004; Doerksen and Shimamura, 2001). This assumption is in line with findings showing that negative stimuli, particularly threatening stimuli, are more likely to attract attention (Buchner, Rothermund, Wentura, and Mehl, 2004; Wentura, Rothermund, and Bak, 2000) and may be better remembered (D'Argembeau and Van der Linden, 2004; Doerksen and Shimamura, 2001; Kensinger and Corkin, 2003) than neutral or positively valent stimuli. Recently, we have found a source memory advantage for faces associated with disgusting behavior (Bell and Buchner, in press). Given that good source memory for cheaters is adaptive because it helps the individual to avoid interactions with potentially dangerous others, it makes sense that the source memory advantage generalizes to other threatening contexts.

To summarize, the results of the present experiment show that source memory for names of cheaters is better than source memory for other types of names, whereas old-new discrimination is identical for names associated with cheating and other types of names. Source memory for names of cheaters may indeed be useful for avoiding cheaters in future interactions. The fact that the present data pattern closely replicates results obtained with facial stimuli (Buchner et al., 2009) suggests that better source memory for cheaters may be due to mechanisms that increase source memory for information associated with cheating regardless of the specific nature of that information rather than to a cheater-detection module closely tied to the face processing system.

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References

Axelrod, R., and Hamilton, W. D. (1981). The evolution of cooperation. *Science*, *211*, 1390-1396.

Barclay, P. (2008). Enhanced recognition of defectors depends on their rarity. *Cognition*, *107*, 817-828.

Barclay, P., and Lalumière, M. L. (2006). Do people differentially remember cheaters? *Human Nature*, *17*, 98-113.

Batchelder, W. H., and Riefer, D. M. (1990). Multinomial processing models of source monitoring. *Psychological Review*, *97*, 548-564.

Bayen, U. J., Murnane, K., and Erdfelder, E. (1996). Source discrimination, item detection, and multinomial models of source monitoring. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *22*, 197-215.

Bayen, U. J., Nakamura, G. V., Dupuis, S. E., and Yang, C. L. (2000). The use of schematic knowledge about sources in source monitoring. *Memory & Cognition*, *28*, 480-500.

Bell, R., and Buchner, A. (in press). Valence modulates source memory for faces. *Memory & Cognition*.

Bell, R., Buchner, A., and Mund, I. (2008). Age-related differences in irrelevant-speech effects. *Psychology and Aging*, *23*, 377-391.

Bornstein, R. F. (1989). Exposure and affect: Overview and meta-analysis of research, 1968-1987. *Psychological Bulletin*, *106*, 265-289.

Bröder, A., and Meiser, T. (2007). Measuring source memory. *Zeitschrift fur Psychologie/Journal of Psychology*, *215*, 52-60.

Buchner, A., Bell, R., Mehl, B., and Musch, J. (2009). No enhanced recognition memory, but better source memory for faces of cheaters. *Evolution and Human Behavior*, *30*, 212-224

Buchner, A., Rothermund, K., Wentura, D., and Mehl, B. (2004). Valence of distractor words increases the effects of irrelevant speech on serial recall. *Memory & Cognition*, *32*, 722-731.

Chiappe, D., Brown, A., Dow, B., Koontz, J., Rodriguez, M., and McCulloch, K. (2004). Cheaters are looked at longer and remembered better than cooperators in social exchange situations. *Evolutionary Psychology*, *2*, 108-120.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences*. Hillsdale: Lawrence Erlbaum Associates Inc.

Cosmides, L. (1989). The logic of social exchange: Has natural selection shaped how humans reason? Studies with the Wason selection task. *Cognition*, *31*, 187-276.

Cosmides, L., and Tooby, J. (1992). Cognitive adaptations for social exchange. In J. H. Barkow, L. Cosmides, and J. Tooby (Eds.), *The adapted mind: Evolutionary psychology and the generation of culture* (pp. 163-228). New York, NY, US: Oxford University Press.

Cosmides, L., and Tooby, J. (2005). Neurocognitive adaptations designed for social exchange. In D. M. Buss (Ed.), *The handbook of evolutionary psychology* (pp. 584-627). Hoboken, NJ, US: John Wiley & Sons Inc.

D'Argembeau, A., and Van der Linden, M. (2004). Influence of affective meaning on memory for contextual information. *Emotion*, *4*, 173-188.

Doerksen, S., and Shimamura, A. P. (2001). Source memory enhancement for emotional words. *Emotion*, *1*, 5-11.

Dunbar, R. I. M. (2004). Gossip in evolutionary perspective. *Review of General Psychology*, *8*, 100-110.

Enquist, M., and Leimar, O. (1993). The evolution of cooperation in mobile organisms. *Animal Behaviour*, *45*, 747-757.

Farrelly, D., and Turnbull, N. (2008). The role of reasoning domain on face recognition: Detecting violations of social contract and hazard management rules. *Evolutionary Psychology*, *6*, 523-537.

Faul, F., Erdfelder, E., Lang, A. G., and Buchner, A. (2007). G*Power3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, *39*, 175-191.

Glanzer, M., Adams, J. K., Iverson, G. J., and Kim, K. (1993). The regularities of recognition memory. *Psychological Review*, *100*, 546-567.

Kensinger, E. A., and Corkin, S. (2003). Memory enhancement for emotional words: Are emotional words more vividly remembered than neutral words? *Memory & Cognition*, *31*, 1169-1180.

Mealey, L., Daood, C., and Krage, M. (1996). Enhanced memory for faces of cheaters. *Ethology and Sociobiology*, *17*, 119-128.

Mehl, B., and Buchner, A. (2008). No enhanced memory for faces of cheaters. *Evolution and Human Behavior*, *29*, 35-41.

Murnane, K., and Bayen, U. J. (1996). An evaluation of empirical measures of source identification. *Memory & Cognition*, *24*, 417-428.

Nowak, M. A., and Sigmund, K. (2005). Evolution of indirect reciprocity. *Nature*, *437*, 1291-1298.

Oda, R. (1997). Biased face recognition in the prisoner's dilemma game. *Evolution and Human Behavior*, *18*, 309-315.

Poh, J., and Fiddick, L. (2008). *Memory for cheaters: Faces or rules?* Paper presented at the 20st Annual Meeting of the Human Behavior and Evolution Society, Kyoto, Japan, June 4 – 8, 2008.

Rothkegel, R. (1999). AppleTree: A multinomial processing tree modeling program for Macintosh computers. *Behavior Research Methods, Instruments and Computers*, *31*, 696-700.

Schmidt, S. R. (1991). Can we have a distinctive theory of memory? *Memory & Cognition*, *19*, 523-542.

Snodgrass, J. G., and Corwin, J. (1988). Pragmatics of measuring recognition memory:

Applications to dementia and amnesia. *Journal of Experimental Psychology: General*, *117*, 34-50.
Spaniol, J., and Bayen, U. J. (2002). When is schematic knowledge used in source monitoring? *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *28*, 631-651.
Stahl, C., and Klauer, K. C. (2007). HMMTree: A computer program for latent-class hierarchical multinomial processing tree models. *Behavior Research Methods*, *39*, 267-273.
Trivers, R. L. (1971). The evolution of reciprocal altruism. *The Quarterly Review of Biology*, *46*, 35-57.
Wentura, D., Rothermund, K., and Bak, P. (2000). Automatic vigilance: The attention-grabbing power of approach- and avoidance-related social information. *Journal of Personality and Social Psychology*, *78*, 1024-1037.
Wilson, D. S., and O'Gorman, R. (2003). Emotions and actions associated with norm-breaking events. *Human Nature*, *14*, 277-304.
Wilson, D. S., Wilczynski, C., Wells, A., and Weiser, L. (2000). Gossip and other aspects of language as group-level adaptations. In L. Huber, and C. Heyes (Eds.), *The evolution of cognition* (pp. 347-365). Cambridge, MA, US: The MIT Press.