Research article

Individual differences in prejudice and associative versus rule-based forms of transitive reasoning

GRZEGORZ SEDEK1*, KINGA PIBER-DABROWSKA1,2, GREGORY R. MAIO2 AND ULRICH VON HECKER3

Abstract

Two experiments examined whether individual differences in prejudice are associated with different reasoning styles when targets and nontargets of prejudice are processed in the same context. High-prejudice and low-prejudice participants studied pairwise relations between four persons (one a prejudice target, three nontargets). Stereotypes were made salient by using specific ethnic names and stereotypic traits to define relations between the targets. Relations between the persons were always stereotype congruent in Experiment 1, whereas they were sometimes stereotype incongruent in Experiment 2. We examined study time, relational memory, and transitive reasoning in both experiments. The results of both experiments indicated that the high-prejudice participants studied sets of relations presented to them faster than did the low-prejudice participants. The high-prejudice participants were also more likely to show impaired relational memory and reasoning about nontarget persons but no such limitations with respect to target persons. This novel evidence that prejudice might substantially impair memory and transitive reasoning processes about nontarget persons is discussed in the light of alternative theoretical frameworks in the social cognition and emotion domains. Copyright © 2011 John Wiley & Sons, Ltd.

When stereotypes are salient, individuals high and low in negative prejudice differ in the way they apply stereotypes during social perception and inference making (Dovidio, Glick, & Rudman, 2005; Jost, Banaji, & Nosek, 2004; Park & Judd, 2005; Rutland & Brown, 2001). As argued by Allport (1954) and Tajfel (1969), prejudice may lie at the root of how stereotypes are formed, maintained, and applied in relevant social contexts. Whereas social cognitive research has so far concentrated on the role of prejudice in judgments about the targets of prejudice themselves, this research addresses the influence of prejudice on cognitive processes that involve not only targets but also nontargets of a given stereotype. Here, we use the term “targets” to refer to members of negatively evaluated outgroups (e.g., Germans, for some Polish participants), and the term “nontargets” to indicate members of the ingroup, toward whom we assume participants do not feel negatively prejudiced (e.g., Poles, for Polish participants). We are interested in memory and reasoning processes that maintain and logically integrate perceived relations between a number of targets and nontargets simultaneously, as is typical for complex social environments.

Although stereotypes can be energy-saving and efficient cognitive devices (Macrae, Milne, & Bodenhausen, 1994a; Sherman, Lee, Bessenoff, & Frost, 1998; for a broader review, see Fiske, 1998; Sherman, 2001), level of prejudice is a likely moderator of the application of stereotypes in the perception of a small group of diverse targets and nontargets. For example, imagine that a perceiver learns about the differences in aggressiveness between a small number of people, say one person with a German name, Helmut and three people with a Polish name, Maciej, Bogdan, and Leszek. The perceiver may learn that “Helmut is more aggressive than Maciej,” “Maciej is more aggressive than Bogdan,” and “Bogdan is more aggressive than Leszek”. If the perceiver happens to be Polish and is negatively prejudiced toward Germans, he or she might endorse the stereotype that Germans are aggressive. This schematic knowledge might be relevant to a perceiver when making sense of the differences in aggressiveness between Helmut, a stereotype target, and all other (nontarget) persons involved. On the other hand, there might still be differences in aggressiveness to be perceived between nontarget persons (i.e., Maciej, Bogdan, & Leszek). Accurate perception requires that these differences need to be processed as well, and stereotypes cannot be used to differentiate between the nontarget persons.

We sought to examine this context using a dual-process reasoning framework (Sloman, 1996; Evans & Over, 1996). This framework is fundamental in the cognitive sciences
for the interpretation of the striking differences between
descriptive and normative models of human reasoning
(Evans, 2003; Stanovich & West, 2000). Models of this type
distinguish between two qualitatively different systems of
reasoning: an “associative” system tends to solve reasoning
tasks on the basis of prior knowledge and beliefs (e.g.,
stereotypes), whereas a “rule-based” system supports rea-
soning according to logical rules. The associative system
of reasoning is based on pre-existing, well-learned,
and strong associations and is therefore assumed to be
quick and sometimes automatic. The rule-based system,
on the other hand, is assumed to be effort-based, elabora-
tive, slower, and based on logical rules or other learned
formal systems. The associative system is also assumed to
operate in a highly contextualized way, whereas the rule-
based system may rely more on abstract rules (Stanovich
& West, 2000).

In line with distinctions made by Sloman (1996) and
Stanovich and West (2000), we predict that high-prejudice
participants tend to apply fast and simple forms of associative
processing in a stereotype-salient context, whereas low-
prejudice participants tend to apply slower, elaborate, rule-
based forms of reasoning. As noted by Sloman (1996, see
Table 1, page 7), associative processing easily relies on
available stereotypes. Therefore, high-prejudice individuals
should be more quickly inclined to conclude that the prejudice
target in the aforementioned example (Helmut) is the most
aggressive among all others. However, highly prejudiced
individuals should de-emphasize the differences in aggression
between the remaining nontarget persons and see them as
largely irrelevant. On this basis, we predict that high-prejudice
participants are less able than low-prejudice participants to rank
the nontarget persons accurately in terms of aggressiveness.
These predictions are consistent with the classical categorization
model of Fiske and her associates (Fiske, 1998; Fiske, Lin, &
Neuber, 1999; Fiske & Neuber, 1990). For high-prejudice
individuals, the “between-group categorization,” that is, cate-
gorization between target and nontarget persons, is so quick
and so subjectively important that it might effectively curtail
the reasoning task, which is to establish a “within-group”
ranking, that is, a ranking of the nontarget persons against
one another. In contrast, if low-prejudice people adopt more
abstract ways of reasoning, they should be more likely to focus
on logical ranking between all four presented persons and be
less distracted by the social categorization.

Research by Sherman, Stroessner, Conrey, and Azam
(2005) provides an example of evidence broadly congruent
with this reasoning. In their research, high-prejudice partici-
pants formed more uniformly stereotypical impressions on
the basis of behavioral information than low-prejudice partici-
pants did. In contrast, low-prejudice participants based their
impressions on stereotypes when the behavioral information
given was stereotypical but formed individuated impressions
when the behaviors were stereotype inconsistent. Hence,
low-prejudice individuals appeared to use stereotypes in a
different, more context-sensitive, way than high-prejudice
individuals.

Nonetheless, to our knowledge, past research has not
examined the effects of prejudice on stereotype application
when perceivers are processing information about target and
nontarget persons in a situation where the stereotype is par-
tially relevant. The past findings lead us to three hypotheses
about the effects of prejudice in this context. First, high-
prejudice participants should take significantly less time to
study information about the targets and nontargets than low-
prejudice participants, because associative processes are faster
than rule-based reasoning in a stereotype-salient context.
Second, high-prejudice participants should exhibit better recall
and reasoning about relations involving the target of prejudice
than about relations involving nontargets. Low-prejudice
participants, on the other hand, should exhibit similar, high
levels of accuracy for memory and reasoning with respect to
relations involving the prejudice target or nontargets.

Third, if rule-based processes are involved in a reasoning
outcome involving a prejudice target (e.g., using the previous
example, “Helmut is more aggressive than Maciej,” and
“Maciej is more aggressive than Bogdan,” therefore “Helmut
is more aggressive than Bogdan”), then the accuracy for a later
test query about the relation between the pair Helmut and
Bogdan should correlate with memory for the two premises
on which the transitive inference is based. Alternatively, if
the test response on a pair involving Helmut is based on an as-
 sociative process of concluding from stereotypical knowledge,
which would involve no rule-based reasoning, the accuracy
of that response should be uncorrelated with the accuracy of
premise retrieval. Thus, high-prejudice participants may show
no relation between their transitive reasoning and memory,
whereas the same type of reasoning outcomes for low-prejudice
participants are significantly correlated with memory accuracy
for the premises.

However, this difference may not arise when the relative
position of the prejudice target is sometimes congruent and
sometimes incongruent with the prevailing stereotype. In
line with existing research evidence (see Experiment 2), we
predict increased study times for analyzing pairs with incon-
gruent relations. Because of highly prejudiced participants’
increased preoccupation with congruent or incongruent rela-
tions between target and nontarget persons within the presented
pairs, we predict that high-prejudice individuals show even
greater neglect of the relations involving only nontarget per-
sons, and as a consequence, we expect larger effect sizes for
the influence of prejudice on memory and reasoning about non-
target persons.

The experimental design of the two studies allows us also
to analyze the potential moderating or mediating role of two
additional variables, namely the type of cognitive operation
(memory versus reasoning) and reasoning difficulty. In our
performance tests, we are able to distinguish memory perfor-
mance from reasoning performance. According to the second
hypothesis, we generally expect lower accuracy for nontarget
as compared with target relations for high-prejudice partici-
pants but no differences in accuracy for nontarget versus target
relations for low-prejudice participants. However, the question
arises whether such differences will appear in the same way in
terms of accuracy for memory and reasoning performance.
Similarly, one might also ask whether the expected interaction
between prejudice and type of relation will be moderated by
the difficulty of the reasoning task (it is plausible that such
an interaction might be more pronounced in more difficult rea-
soning problems).
As a paradigm, we chose transitive reasoning (Johnson-Laird, 1972; Leth-Steensen & Marley, 2000) because it yields an objective criterion for memory maintenance and for the outcome of reasoning. For example, upon learning a series of relations such as “A is taller than B” and “B is taller than C,” it may be deduced by transitivity that “A is taller than C,” even if that information is not presented. An advantage of this paradigm is that, upon later testing, queries on the relations between A and B or between B and C constitute a test of relational memory, whereas a query on the relation between A and C constitutes a test of reasoning. This distinction has been successfully used in past research to disentangle relational memory and reasoning components of task performance in various populations (Sedek & von Hecker, 2004; Sedek, Brzezicka, & von Hecker, 2010).

**EXPERIMENT 1**

**Method**

**Participants and Overall Procedure**

The participants were 54 high school students (17–19 years old) from Warsaw, Poland, selected from 116 students who had completed the Individual Association Questionnaire (IAQ) during class at high school. This group of 54 was selected after having been classified as high-prejudice (27 participants—18 women, 9 men) or low-prejudice (27 participants—16 women, 11 men) toward Germans. This classification was derived using the IAQ and memory assessment procedures described in the succeeding paragraphs.

After 7–9 days, the participants classified as high or low in prejudice were invited to the laboratory in order to participate in the main task, which included the transitive reasoning methodology. The participants were then probed for suspicion and debriefed.

**Questionnaire-Plus-Memory Assessment**

**Pilot Studies and Materials.** In this research, a novel, integrative approach to assessing prejudice was applied (Piber-Dabrowska, 2001; Piber-Dabrowska, Sedek, & Kofta, 2010). Since Peabody’s seminal research (1967, 1970), it is well-known that the same descriptive behavior (e.g., conservative with money) might be evaluated negatively or positively (e.g., thrifty versus cheap). We previously obtained evidence that prejudice may play an important role in the perceived connotations of descriptive traits. This evidence was discovered in responses to the Polish General Social Survey (Kofta & Sedek, 2005). The survey was conducted on a representative national sample of Poles and included open questions about ethnic stereotypes, such as “Please describe the typical German person in your own words.” Content analyses revealed that the respondents with negative attitudes tended to interpret particular traits more negatively than the respondents with positive attitudes. For instance, an individual with a negative attitude was more likely to view the typical German person as “arrogant” than as “self-assured” or as a “workaholic” than as “hardworking.” As noted by one anonymous reviewer, these findings are in full agreement with Allport’s (1954) observation that people who dislike a particular group can change any positive trait into a negative characteristic.

The IAQ scale (Piber-Dabrowska, 2001) draws on this evidence by using sets of synonym expressions of stereotypical traits of Germans. Each set contains synonymous expressions that refer to the same trait descriptively (e.g., referring to Germans as working hard), but the synonyms clearly varied on valence on the evaluative level (e.g., “hardworking,” “diligent worker,” “fears no task,” “workaholic”). The selection and valence of all 112 synonyms (14 sets with eight synonyms) in the IAQ was established by 30 competent judges (university students) in a previous validation study (Piber-Dabrowska, 2001). For example, eight descriptively synonymous expressions (with relative evaluative valences in brackets) for a person who is efficient were as follows: (1 negative) “cunning,” “combiner”; (2 somewhat negative) “crafty,” “shrewd”; (3 somewhat positive) “go-ahead,” “has plenty of know-how”; (4 positive) “resourceful,” “efficient”. As another example, eight descriptively synonymous expressions for a person who is conceived were as follows: (1 negative) “conceited,” “pretentious”; (2 somewhat negative) “presumptuous,” “puts on airs”; (3 somewhat positive) “convinced he is right,” “self-certain”; (4 positive) “has a high opinion of himself,” “not very self-critical.”

The synonymous expressions pertaining to a particular trait are presented in alphabetical order in the IAQ. The participants in this experiment were asked to select up to one expression in each set that they think best fit their notion of a typical German. If the set did not contain any expression that would come to mind when the participants heard the word “Germans,” then the participants could select “none of these expressions.” After responding, the participants were asked to complete an unrelated questionnaire and finally, unexpectedly, were asked to recall all expressions they had previously indicated. Only correctly recalled synonyms were used for calculating the measure of prejudice—the rationale for this approach is described in the succeeding paragraphs. Participants’ mean evaluations could range from 1 (negative) to 4 (positive). Lower scores reflect more negative mean evaluations in the recalled traits and, therefore, more negative prejudice toward the group.1

In this research, we were particularly interested in the negatively prejudiced end of the evaluative spectrum; hence, we classified as high in prejudice 27 participants whose mean evaluations of Germans were below 2, and we classified as low in prejudice 27 participants whose mean evaluation score fell between 2.5 and 3.2 (slightly above the midpoint of scale). To provide a straightforward and conservative test of our

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1There are important similarities and differences between the IAQ and well-known open-ended measures of attitudes developed by Esses and her associates (Bell, Esses, & Maio, 1996; Esses, Haddock, & Zanna, 1993). In both methods, the participant identifies attributes of a social group. The basic difference is that the open-ended method asks participants to generate the descriptions and evaluate them, whereas the IAQ asks participants to select the most appropriate descriptions from a closed list of synonymous expressions, and the evaluations are based on standard points provided by competent judges. The open-ended approach may be better suited for eliciting spontaneous, accessible responses, whereas the IAQ is better suited at controlling for trait content at each level of valence.
reasoning, we did not invite to our second session 62 participants who exhibited highly ambivalent or positive evaluations.

Is it worth noting that the recall procedure allowed us to assess more precisely the latent attitude structure among the participants, especially in a context where stereotypes are salient. As shown in many studies, participants most effectively encode and recall information that is consistent with their stereotypes and prejudices (Macrae, Stangor, & Milne, 1994b; Quinn, Hugenburg, & Bodenhausen, 2004; Sherman et al., 1998; von Hippel, Sekaquaptewa, & Vargas, 1995). Thus, the unexpected memory recall facilitates the identification of a coherent evaluative structure, which is not so much contaminated by socially desirable responding, as when people complete a questionnaire requesting explicit evaluations of outgroup members (see e.g., Crandall & Eshleman, 2003; Sritharan & Gawronski, 2010). Indeed, this assumption was supported in a separate study (Piber-Dubrowska, 2001) involving 92 university students. Those who exhibited higher prejudice on the IAQ also exhibited higher prejudice on the Implicit Association Test, which is not typically associated with explicit self-report measures of prejudice (Greenwald, McGhee, & Schwartz, 1998). In sum, then, the IAQ’s questionnaire-plus-recall memory assessment usefully integrates linguistic and memory approaches to provide a novel method for examining prejudice, and this research provided a useful context for further demonstrating its utility.

**Main Task: Transitive Reasoning Task**

**Materials.** The main task in both experiments presented information about relations between sets of four persons in fictitious mixed groups, consisting of one German person (prejudice target, identified by an obviously German name) and three Poles (nontargets, identified by standard Polish names). Specifically, the participants first received a written scenario about a hypothetical Polish teacher at a mixed Polish–German camp. The teacher, as it was explained, would notice pairwise relations between four students, one of whom was German, (e.g., Helmut), and three were Polish (e.g., Maciej, Bogdan, Leszek). To make a stereotype-relevant context highly salient, we chose the relations to be typical for negative stereotypes of Germans in Poland (e.g., aggressive). For example, one set of relations would be (Figure 1):

- Helmut is more aggressive than Maciej.
- Maciej is more aggressive than Bogdan.
- Bogdan is more aggressive than Leszek.

Using these materials, we may probe the relational memory with questions like “Helmut is more aggressive than Maciej: True or False?” or “Leszek is more aggressive than Bogdan: True or False?”—a correct answer involved successful retrieval of a relation between target and nontarget persons, or solely between nontarget persons, from memory. Transitive reasoning, in turn, may be probed with questions such as “Bogdan is more aggressive than Helmut: True or False?”

![Figure 1. Schematic representation of the linear orders task. Note: The task consisted of the two phases: learning phase and test phase. In the learning phase, participants study the subsequently presented relations at their own pace. In the test phase, participants are queried about previously presented relations (memory test) and about relations that could be inferred (reasoning test). The first name identifies the target German person (Helmut); the other three names identify the nontarget Polish persons (Maciej, Bogdan, Leszek). The target person is located highest (confirming the negative stereotype) in the mental array of aggressiveness (from the most aggressive to the least aggressive persons). The correct answers in the test phase are in bold.

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<tr>
<th>Learning phase</th>
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<tbody>
<tr>
<td>(freely paced for participants)</td>
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<tr>
<td>Helmut is more aggressive than Maciej</td>
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<tr>
<td>Maciej is more aggressive than Bogdan</td>
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<tr>
<td>Bogdan is more aggressive than Leszek</td>
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<tr>
<th>Test phase</th>
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<tr>
<td>(freely paced for participants)</td>
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<tr>
<td>Helmut is more aggressive than Maciej: (memory task, target relation AB) True or False?</td>
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<tr>
<td>Leszek is more aggressive than Bogdan: (memory task, nontarget relation CD) True or False?</td>
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<tr>
<td>Bogdan is more aggressive than Helmut: (2 - step reasoning, target relation AC) True or False?</td>
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<tr>
<td>Maciej is more aggressive than Leszek: (2 - step reasoning, nontarget relation BD) True or False?</td>
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<th>MENTAL ARRAY</th>
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<td>“&gt;” = relation: more aggressive</td>
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<tr>
<td>Helmut (A); Maciej (B); Bogdan (C); Leszek (D)</td>
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<tr>
<td>A &gt; B &gt; C &gt; D</td>
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or “Maciej is more aggressive than Leszek: True or False?” Correct answers to such queries required more than mere recall of the presented information. Instead, the participants needed to integrate two premises to derive the response. Deriving the first correct answer, “False,” demanded the integration of two premises, with one involving a German person (target). Arriving at the second correct answer, “True,” however, demanded the integration of two pairs, each involving non-target persons only.

The six order types used by Sedek and von Hecker (2004) were used as stimulus materials. There were six different name sets (all men). Each name set consisted of four names (three standard Polish names and one obviously German name). Six adjectives were used to denote six transitive relations. The assignment of adjectives to types of order was counterbalanced across the participants, such that each participant was presented with each adjective and each order type exactly once. Each adjective appeared in each order type condition exactly once across every cycle of six participants. In each person set, one single stereotype-target person was used (identified by the German name, e.g., “Helmut”), the other three were nontarget persons (identified by Polish first names). The relations between persons expressed the content of the most frequent negative stereotypes toward Germans (“more aggressive,” “more arrogant,” “more conceited,” “more false,” “more greedy,” “more stiff”) across the six linear-order
problems. In Experiment 1, the position of the target person was always the most extreme one (e.g., Helmut was most aggressive—see Figure 1) across all linear-order tasks, that is, the target person was always placed at the position that confirmed the stereotypic view.

There were three levels of linear-order difficulty created by manipulating the order of the presented three pairs of relations. In the simplest problems, three presented relations (formally defined here as A > B and B > C and C > D) could be successively integrated step by step into the coherent mental array A > B > C > D because of the presence of linking elements (appropriately B and C) in subsequent pairs. Figure 1 illustrates the simplest linear orders using the actual names and stereotypic relations. The relations presented in the most difficult problems (such as C > D, A > B, B > C) made high demands on working memory because the two pairs presented in the beginning did not have any linking element, and only the third pair, presented last (B > C) finally allowed for the full construction of the mental array (A > B > C > D), by an additional mental “shifting” of the previously presented relations. The presented pairs in the problems of moderate difficulty (such as B > C, C > D, A > B) first allowed for a partial integration of the preliminary two pairs but then also demanded a shifting of the third pair “to the front,” in order to create the correct mental array (A > B > C > D).

Main Task: Procedure

First, the participants were given a general instruction sheet and were told that the study was about learning and recalling comparisons within small groups of four students, explaining the aforementioned scenario. The participants were told that they were to study several sequences of pairwise relations during a “learning phase” and were asked to memorize the two names and the relation between them for later recall. The participants were to study each relation at their own pace, initiating the first relation and moving from one relation to the next by pressing the space bar. Each sentence was preceded by a 1500 ms presentation of a fixation symbol “X” in the center of the computer screen.

The learning phase was immediately followed by a test phase. During each test phase, the participants were asked about all possible relations between the four persons. These relations were phrased as sentences and were presented in a random order. Sentences were either in correct format, conforming to the learned order (e.g., “Helmut is more aggressive than Maciej”), or in false format, that is, contradicting the order (e.g., “Leszek is more aggressive than Bogdan”, see Figure 1). Among the three test items addressing accuracy of relational memory (one involving target persons and two involving only nontarget persons), there was always one randomly determined query in false format. Among the two test items addressing accuracy of transitive reasoning (one involving target person and one involving only nontarget persons), one was in false and one in correct format. The participants used the marked left and right arrow keys to indicate whether or not the query sentence reflected a correct statement, according to what they had learned earlier. All participants were asked to respond as quickly and as accurately as possible.

To focus attention on each particular task component, we always displayed the word “LEARNING” or “TEST” appropriately in the upper left corner of the screen. Between the learning–test sequences, a 4-item set of easy arithmetic was interspersed to clear participants’ memory from previous materials. After two practice trials, the participants began the main part of the experiment. This part involved six blocks of learning–test–arithmetic, except for the sixth block, after which no arithmetic task was given.

Results

Study Times

The study times of high-prejudice and low-prejudice participants were examined. The participants were compared at the three levels of order difficulty and for pairs involving or not involving the target of prejudice. That is, we examined whether pairs involving the target (e.g., Helmut is more aggressive than Maciej) were studied differently than pairs involving just nontargets (e.g., Bogdan is more aggressive than Leszek). In this and subsequent analyses, the Huynh–Feldt correction was applied when the sphericity assumption for any within-subjects effects was violated. Distributions of reaction time (RT) data were positively skewed, as is typical for RT. Thus, we applied the standard procedure of log transformation (natural logarithms) to normalize distributions. However, for clarity of presentation, RT will be expressed in raw second units in reported means and figures.

A 2 (prejudice: high versus low; between subjects)×3 (order difficulty: simple versus moderate versus difficult; within subjects)×2 (relation: target versus nontarget; within subjects) ANOVA revealed three main effects and one interaction effect. A main effect of prejudice, F(1, 52) = 7.67, p < .01, η² = .129, revealed that, as predicted, participants who were highly prejudiced toward Germans studied the presented relations for less time (M = 6.81 s, SD = 2.62) than low-prejudice participants (M = 9.66 s, SD = 4.82). In addition, there was a main effect for order difficulty, F(2, 104) = 10.76, p < .001, η² = .171. A posteriori Newman–Keuls tests showed that pairs of relations in the most difficult orders were studied longer (M = 9.68 s, SD = 6.27) than correspondent pairs of relations in simple orders (M = 7.55 s, SD = 3.73) and moderately difficult orders (M = 7.47 s, SD = 3.97), p < .001. There was also a marginally significant main effect of target, F(1, 52) = 3.28, p < .08, η² = .059, such that relations involving the target persons were studied longer (M = 8.56 s, SD = 4.32) than relations involving only nontarget persons (M = 7.90 s, SD = 4.22).

The results also yielded a significant order difficulty × relation interaction, F(2, 104) = 6.13, p < .01, η² = .105. Simple effects revealed (Figure 2) that relations involving the target were studied significantly longer than relations involving nontarget persons by all participants for the simplest linear orders relations, F(1, 52) = 12.08, p < .001, but this difference was not reliable for more difficult linear orders. Additionally, relations involving the target produced similar (and high) levels of study time, irrespective of order difficulty, whereas the study time was a linear and significant function of order difficulty for nontarget relations, F(2, 51) = 16.72, p < .001.
Relational Memory and Reasoning Accuracy

As shown in Figure 1, we determined the proportion of correct answers to queries for the two types of test relations (target versus nontarget) and for the two types of cognitive operation (relational memory versus reasoning) for each participant and each order. These scores were compared between the three levels of order difficulty.

A 2 (prejudice: high versus low) × 2 (type of relations: target versus nontarget) × 2 (cognitive operation: memory versus reasoning) × 3 (order difficulty: orders 1–2 versus orders 3–4 versus orders 5–6) ANOVA on the accuracy measure yielded three main and one interaction effects. First, there was a main effect of prejudice, $F(1, 51) = 5.61$, $p < .05$, $\eta^2_p = .099$, with a higher proportion of accurate answers in the low-prejudice group ($M = 0.86$, $SD = 0.13$) than in the high-prejudice group ($M = 0.78$, $SD = 0.10$). This main effect was qualified by a significant prejudice × type of relations interaction, $F(1, 51) = 6.42$, $p < .05$, $\eta^2_p = .122$. As shown in Figure 3, questions about the nontarget persons were less accurately answered by high-prejudice participants than by low-prejudice participants—a simple effect, $F(1, 51) = 10.48$, $p < .01$. To examine more precisely the significance and effectiveness of both relational memory and reasoning, we performed some additional planned comparisons. They showed that high-prejudice participants in comparison with low-prejudice participants had lower relational memory scores ($F(1, 51) = 5.57$, $p < .05$, $\eta^2_p = .097$) and lower reasoning accuracy ($F(1, 51) = 8.07$, $p < .01$, $\eta^2_p = .130$) about nontarget persons. The proportion of correct answers for target relations did not differ reliably between high-prejudice and low-prejudice participants. In addition, accuracy for target versus nontarget persons was different for participants low versus high in prejudice. In the low-prejudice group, the proportion of correct answers was similar for target and nontarget persons. In contrast, a simple effect in the highly prejudiced group showed a significantly lower accuracy for nontarget than for target persons, $F(1, 51) = 7.36$, $p < .01$.

A main effect of cognitive operation, $F(1, 51) = 15.98$, $p < .001$, $\eta^2_p = .239$, indicated that the memory retrieval operations were more accurate (proportion of correct retrieval, $M = 0.87$, $SD = 0.11$) than the reasoning operations (accuracy, $M = 0.78$, $SD = 0.18$). The final main effect of order difficulty, $F(2, 102) = 21.33$, $p < .001$, $\eta^2_p = .295$, demonstrated (Newman–Keuls procedure, $p < .001$) that the difficult orders were retrieved less accurately ($M = 0.73$, $SD = 0.18$) than the simple orders ($M = 0.88$, $SD = 0.14$) or the moderately difficult orders ($M = 0.86$, $SD = 0.16$).

Path Analysis and Saturated Regression Analyses

We conducted an additional set of analyses to elucidate more precisely the specific influence of prejudice on attention, relational memory, and transitive reasoning, concerning nontarget and target persons.

Path Analysis of Study Times, Memory, and Reasoning about Nontarget Relations. We tested whether there was a direct influence of prejudice on reasoning processes about nontarget persons or whether the observed effects were mediated at least partially by quick studying style and/or poorer relational memory in high-prejudice individuals.

We conducted a series of path analyses using structural equation models (Figure 3). Those path analyses (from left to right) assume a natural sequence of events as reflected in the procedures: high-prejudice or low-prejudice participants first studied the relations, then memorized them, and finally applied transitive reasoning to them. We started from an overidentified model (with zero degrees of freedom) in which prejudice was entered as a predictor of study time, memory accuracy, and the accuracy of inferred relations. In this first model, study time was also the predictor of both memory and reasoning. In the next path analyses, we sequentially removed those nonsignificant paths that could be removed without leading to unacceptable levels of fit for the whole path analysis. (This successful removing of nonreliable paths increased the degrees of freedom.) The resulting model assumed a mediating role of study time in the relation between prejudice and memory accuracy but not between prejudice and reasoning accuracy, $\chi^2 (2) = 3.08; p < .21$; Comparative Fit Index = 0.96 (Figure 3). That is, as shown in Figure 4, high-prejudice participants’ shorter studying of nontarget relations, relative to low-prejudice participants, was a significant predictor of memory for nontarget relations. However, study time was not the mediator between prejudice and the accuracy of inferred relations (reasoning task). For inferred relations, there was a direct path between prejudice and limited reasoning that was not mediated by relational memory (Figure 4). Thus, the relation between prejudice and memory accuracy for the presented relations was fully
mediated by study time, whereas no direct link is assumed between prejudice and memory.

**Saturated Regression Analysis of Rule-Based Transitive Reasoning** Did participants use rule-based transitive reasoning, or did they make associative inferences from the negative stereotype? We did not observe any relations between prejudice and task performance, that is, with respect to differences between memory and reasoning tasks for the relations involving the target person. However, there are ways to examine whether correct judgments concerning the target relation were based on transitive reasoning (integration of premises) or, more simply, on associative inferences from negative stereotypes. If reasoning is involved, the participants should integrate two premises to arrive at one particular step of transitive inference involving the target person. For example, correct reasoning that Helmut is more aggressive than Bogdan (which we will denote formally as $A > C$) follows from two premises “Helmut is more aggressive than Maciej” ($A > B$), and “Maciej is more aggressive than Bogdan” ($B > C$), see Figure 1. As a result, there should be a significant correlation between the accuracy for the relation that demands transitive reasoning ($A > C$) and the accuracies for this relation’s constituent elements (i.e., $A > B$ and $B > C$). If there is a lack of reliable correlations of this type, we might conclude that the correct answer was based rather on the negative stereotype than on transitive reasoning, because the German target person was most negative on all traits and thus constituted a valid anchor for heuristic reasoning.

To examine this prediction, we constructed a memory index (i.e., the mean across memory accuracies for the AB and BC relations) and calculated beta coefficients for the following formula with reasoning ($AC_{\text{reasoning}}$) as the dependent variable, using a hierarchical regression approach with an interaction term:

$$AC_{\text{reasoning}} = \beta_{\text{memory}} + \beta_{\text{prejudice}} + \beta_{\text{memory} \times \text{prejudice}}$$

Results indicated that memory was a significant predictor of reasoning ($\beta = .31, p < .05$). However, a significant interaction between memory and prejudice also emerged ($\beta = .36, p < .01$). Subsequent decomposition of this interaction showed that there was a strong relation between memory and reasoning in the low-prejudice group ($\beta = .74, p < .001$) but no significant relation in the high-prejudice group ($\beta = .02, ns$). These results support the prediction that high-prejudice participants made associative inferences based on their stereotype, whereas low-prejudice participants used a rule-based form of transitive reasoning to integrate the well-remembered premises into correct linear order.

**Discussion**

On the basis of Sloman’s (1996) and Stanovich and West’s (2000) distinctions, we formulated and examined three hypotheses about different forms of transitive reasoning among (Polish) participants who were high prejudice or low prejudice toward a target social category (Germans). First, the results supported the straightforward hypothesis that high-prejudice participants would study relations significantly faster than low-prejudice participants. This prediction was based on the assumption that associative processing in high-prejudice participants should be faster than rule-based transitive reasoning in low-prejudice participants.

Second, the findings revealed the predicted interactions between prejudice and target (relations involving prejudice target versus nontarget persons) in terms of memory accuracy and reasoning. We predicted that high-prejudice individuals should rely mostly on simple associative processing, by primarily focusing on the ranking that involves target persons and paying relatively less attention to the rankings of nontarget persons. The findings revealed that, among high-prejudice participants, memory accuracy and reasoning about nontarget persons was inferior to the same measures involving target persons. On the other hand, we predicted that the distinction between target and nontarget persons in the transitive reasoning task should be seen as irrelevant among low-prejudice participants (assuming that they use more abstract, rule-based ways of reasoning) and that they should adopt rule-based forms of transitive reasoning. In line with these predictions, low-prejudice individuals exhibited the same (relatively high) levels of accuracy for memory and reasoning measures with respect to target and nontarget persons.

In the light of these findings, it is important to note that, although the present prejudice measure (the IAQ) contains a memory component, it does not follow that higher scores on the measure should predict better memory for the episodic information presented in the main experimental task. The finding that high prejudice was associated with better memory for target information but not for nontarget information shows that high scores on the prejudice measure do not predict high scores on memory per se.

Third, we also found supporting evidence for different types of processing with respect to transitive reasoning involving the target person (demanding integration of two premises) among high-prejudice and low-prejudice participants. Specifically, hierarchical regression analyses showed that only low-prejudice participants used systematic rule-based transitive reasoning as a guide for correctly inferring that the target person was on the most extreme, negative position of the mental model. That is, low-prejudice participants, we found reliable correlations between memory accuracy for premises and accuracy of transitive inference. High-prejudice participants, however, seemed to infer the (top) position within the rank order, as occupied by the target person, from their salient stereotype.
because in this group, there was no reliable correlation between memory accuracy for premises and accuracy for transitive reasoning.

In addition, study times were not only shorter among high-prejudice participants than among low-prejudice participants but also mediated the relationship between prejudice and memory retrieval for nontarget relations. However, path analysis also showed a direct path between prejudice and two-step transitive reasoning about nontarget persons. These results underscore the necessity of seeing the target person in the context of broader social groups that might consist of target and nontarget persons.

To conclude, Experiment 1 yielded consistent evidence that, within a stereotype-salient context, high-prejudice participants applied fast and simpler forms of associative processing to the relational information they were given. In contrast, low-prejudice participants employed rule-based (slower but logically more correct) forms of reasoning.

EXPERIMENT 2

The first aim of Experiment 2 was to replicate the effects of prejudice on study time, memory, and reasoning with a new set of stimuli. The second aim was to examine additional predictions stemming from previous research about stereotype congruency and incongruency effects. These additional predictions pertained to potential shifts in the mechanisms underlying the replicated effects.

To elaborate, social stereotypes and prejudices might be efficient tools for processing stereotype-consistent information (Fiske, 1998; Sherman, 2001). These aspects of activated stereotypes and prejudices are especially clear with respect to the encoding and remembering of stereotype-consistent information. Consistent with this view, Macrae et al. (1994a) found that participants for whom congruent social stereotypes were activated had more resources for performing a second, unrelated task. Stereotypes and prejudices might also facilitate encoding of stereotype-inconsistent information, albeit usually at the expense of additional time devoted for studying stereotype-incongruent information (Fiske & Neuberg, 1990; Sherman & Frost, 2000). In addition, when an experimental situation is stereotype-inconsistent (Blascovich, Wyer, Swart, & Kibler, 1997; Yzerbyt, Leyens, & Bellour, 1995) high-prejudice participants are more vigilant and take longer to make judgments.

Therefore, we predicted specific additional effects in an experimental situation that was not always stereotype-consistent (as it had been in Experiment 1). In Experiment 1, the position of the target person was held constant at the most extreme position, thus always confirming the negative stereotype (the only German among three nontarget—Poles). To examine whether congruency of this position might be an important determinant of participants’ memory and reasoning, we constructed half (i.e. three) of the linear orders to be learned in Experiment 2 in the opposite direction to the stereotype. For example, “Helmut,” the target person, was positioned as the least arrogant among the four persons in those three orders. Three other orders (equalized in difficulty) were designed as before (i.e., portraying the target person as most arrogant).

On the basis of the aforementioned research evidence about increased encoding of stereotype-incongruent information, we hypothesized that for high-prejudice participants, contemplating whether a relevant target confirmed or disconfirmed the stereotypic position within the mental array should increase the likelihood of elaborative, rule-based transitive reasoning processes. Therefore, in contrast to Experiment 1, for both high-prejudice and low-prejudice participants, reasoning about the target should be more rule-based and dependent on memory accuracy of the presented premises.

However, because of the increased focus of high-prejudice participants on the expected or respectively unexpected position of target persons in Experiment 2, nontarget relations should still (or perhaps even more) be ignored more by high-prejudice participants than by low-prejudice participants. Low-prejudice participants should again use a rule-based form of transitive reasoning with respect to both target and nontarget persons. Indeed, because of the stereotype-inconsistent relations, the use of the stereotype might seem even more task-irrelevant to the low-prejudice participants than in Experiment 1. Therefore, we expected to replicate Experiment 1’s evidence in terms of a detrimental impact of negative prejudice on the accuracy of memory and reasoning about nontarget persons.

Method

Participants

Participants were 16 high-prejudice (10 women) and 16 low-prejudice (11 women) high school students (17–19 years of age) from Warsaw (Poland). The same classification procedure of IAQ plus memory as in Experiment 1 was used.

Procedure

The transitive reasoning procedure was administered 7–9 days after the IAQ pretest. The procedure was exactly the same as in Experiment 1, with two exceptions. First, for three of six orders, the position of the target person was stereotype consistent, as in Experiment 1. For the other three orders, the position of the target person was stereotype inconsistent (e.g., Helmut was the least arrogant among four presented persons). The order of administering consistent and inconsistent tasks was random.

Second, we used the same level of difficulty manipulation as in Experiment 1. This manipulation was applied for the three stereotypic orders (e.g., German target person most arrogant).

3It is acknowledged that inconsistent information might, under some conditions, be quickly processed, or even dismissed. It appears that the main determinants of whether or not this happens are motivational and cognitive (Stangor & McMillan, 1992). In terms of motivation, high-prejudice participants in the present study can be assumed to be highly motivated to uphold their stereotypic views and therefore not dismiss inconsistencies, but spend relatively longer time studying them, as compared with consistent materials. In terms of cognitive factors, research has shown that the timing of schema activation is crucial. If the prejudice-relevant schema is activated before the encoding of the information, as in our study, schema inconsistency is particularly likely to be recognized as compared with when the schema is activated at a later point in time (Dijksterhuis & Van Knippenberg, 1995). Thus, even for low-prejudice participants, the prediction is for at least some engagement in inconsistency resolution, provided that the stereotype itself is widely held and well overlearned, as is the case here.
and the three counter-stereotypic orders (e.g., German target person least aggressive and one of three nontarget persons most aggressive). Three order difficulty levels were applied representing the easy, moderate, and high levels of difficulty.

Results

Study Times

To assess attentional focus on presented pairs of relations again, we examined the study times of high-prejudice and low-prejudice participants. The participants were compared at the three levels of order difficulty and for pairs involving or not involving the prejudice target.

An additional variable was the position of the target person, as either at the beginning of the hypothetical mental array (e.g., in the position of most aggressive: Helmut > Maciej > Bogdan > Leszek) or at the end of the mental array (e.g., in the position of least aggressive: Maciej > Bogdan > Leszek > Helmut). In the first case, the presented relation involving the target (i.e., Helmut is more aggressive than Maciej) was congruent with the negative stereotype, whereas in the second array, the presented relation involving the target (i.e., Leszek is more aggressive than Helmut) was incongruent with stereotype content.

As in Experiment 1, distributions of RT data were positively skewed. Hence, a natural logarithm transformation was applied to normalize distributions, but, for clarity of presentation, RTs are described in raw second units. A 2 (prejudice: high versus low; between subjects) × 3 (order difficulty: simple versus moderate versus difficult; within subjects) × 2 (relation: target versus nontarget; within subjects) × 2 (position: first versus last) ANOVA showed three main effects. A main effect of prejudice, F(1, 30) = 13.55, p < .001, ηp² = .311, replicated the previous findings; that is, participants who were highly prejudiced toward Germans studied the presented relations faster (M = 5.61 s, SD = 1.77) than low-prejudice participants (M = 10.56 s, SD = 6.62). There also emerged a main effect of target position, F(1, 30) = 10.91, p < .01, ηp² = .267, such that the stereotype-incongruent relations were studied longer (M = 8.97 s, SD = 6.91) than the stereotype-congruent relations (M = 7.20 s, SD = 4.18). In addition, there was a main effect for order difficulty, F(2, 60) = 3.53, p < .05, ηp² = .105. A posteriori Newman–Keuls tests showed that pairs of relations within the most difficult orders were studied longer (M = 8.53 s, SD = 5.54) than corresponding pairs of relations in simple orders (M = 8.08 s, SD = 5.56) and moderately difficult orders (M = 7.64 s, SD = 6.26), p < .05.

Memory and Reasoning Accuracy

As in the previous experiment, the proportions of correct answers to queries for two types of relations (target versus nontarget persons), as well as the proportions correct for the two types of cognitive operation (memory versus reasoning) were calculated for each participant and each order. These scores were compared between the three levels of order difficulty. An additional variable was the position of target person.

We conducted a 2 (prejudice: high versus low; between subjects) × 2 (type of relations: target versus nontarget) × 2 (cognitive operation: memory versus reasoning) × 3 (order difficulty: simple versus moderate versus difficult) × 2 (target position: first versus last) ANOVA on the proportion of correct answers, with the last four factors occurring within-subjects. This analysis yielded two main effects and three interactions. First, a main effect of prejudice, F(1, 30) = 7.58, p < .01, ηp² = .202, indicated that the proportion of correct answers was significantly lower in the high-prejudice group (M = 0.65, SD = 0.19) than in the low-prejudice group (M = 0.81, SD = 0.14). However, the main effect of prejudice was again qualified by a significant prejudice × type of relations interaction, F(1, 30) = 5.86, p < .05, ηp² = .163, replicating the interaction effect from Experiment 1. As shown in Figure 5, questions about the nontarget persons were less accurately answered by high-prejudice participants than by low-prejudice participants—simple effects, F(1, 30) = 11.25, p < .01. To examine more precisely the significance and effect sizes for both relational memory and reasoning, we performed some additional planned comparisons, as in Experiment 1. They showed that, for presented nontarget persons, high-prejudice participants had lower relational memory, F(1, 30) = 7.98, p < .01, ηp² = .210, and lower reasoning accuracy, F(1, 30) = 6.66, p < .05, ηp² = .182, than low-prejudice participants. As in Experiment 1, the proportion of correct answers for target relations did not differ reliably between high-prejudice and low-prejudice participants. In addition, accuracy for relations involving target persons versus nontarget persons was different for participants low versus high in prejudice. In the low-prejudice group, the proportion of correct answers was similar for target and nontarget persons. In contrast, and as found in Experiment 1, the corresponding simple effect in the highly prejudiced group showed a significantly lower accuracy for nontarget than for target persons F(1, 30) = 7.23, p < .05.

Additionally, a main effect of cognitive operation, F(1, 30) = 10.20, p < .01, ηp² = .254, indicated similar effects as in Experiment 1. That is, the memory retrieval operations were more accurate (proportion of correct retrieval, M = 0.78, SD = 0.20) than the reasoning operations (accuracy, M = 0.68, SD = 0.20).

Path Analysis and Saturated Regression Analyses

As in Experiment 1, we conducted a set of additional analyses to elucidate more precisely the specific influence of prejudice

![Figure 5. Retrieval accuracy (combined relational memory and reasoning) as a function of prejudice and type of relations (Study 2)](image-url)
on attention, relational memory, and transitive reasoning concerning nontarget and target persons.

Path Analysis for Study Times, Memory, and Transitive Reasoning about Nontarget Relations. The question arises again whether there was a direct influence of prejudice on reasoning processes about nontarget persons or whether the observed effects were mediated at least partially by quick studying style and/or poorer relational memory in high-prejudice individuals.

We again started from an overidentified model (with zero degrees of freedom) with all possible links assumed and sequentially removed nonsignificant paths that were not needed for acceptable levels of fit for the whole path analysis. As shown in Figure 6, the resulting model assumed a mediating role of memory accuracy for the link between prejudice and reasoning accuracy. \( \chi^2 (3) = 4.52; p < .21; \) Comparative Fit Index = 0.93. Therefore, the pattern of path relations is different than in Experiment 1. As previously, highly prejudiced participants took less time to study nontarget relations, but in Experiment 2, prolonged study time was neither reliable predictor of memory nor of reasoning accuracy.

Saturated Regression Analysis of Rule-Based Transitive Reasoning. In Experiment 2, it was impossible to infer the position of the target person when only the stereotype is used as a cue (instead of using transitive reasoning) because the position of the target was sometimes congruent and sometimes incongruent with the stereotype. As a consequence, hierarchical regression analysis showed neither the interaction effect between prejudice and premise memory nor the main effect of prejudice on accuracy of reasoning about target relations. The only reliable predictor of reasoning accuracy for target relations was relational memory (\( \beta = .61, p < .001 \)). The same pattern appeared for separate analyses of stereotype-congruent and stereotype-incongruent relations.

Discussion

Experiment 2 replicated the two main findings of Experiment 1. First, high-prejudice participants studied the three linear-order pairs reliably quicker than did low-prejudice participants (the relations between the presented pairs again expressed content of negative stereotypes about the target). Second, high-prejudice participants exhibited poorer memory and reasoning about nontarget persons than low-prejudice participants. The results are again in favor of the applicability of the distinction between associative and rule-based transitive reasoning proposed by Sloman (1996) and by Stanovich and West (2000). High-prejudice participants might be viewed as using concrete stereotypes, whereas low-prejudice participants utilized abstract logical rules.

As expected, some additional effects emerged when incongruency was introduced in Experiment 2. As predicted from assumptions about an enhanced encoding of stereotype-incongruent information (Fiske & Neunberg, 1990; Sherman, 2001), relations containing stereotype-incongruent information were studied significantly longer than stereotype-congruent linear problems. Additionally, both high-prejudice and low-prejudice participants seemed to use more elaborative, rule-based forms of transitive reasoning about target relations, because the accuracy of memorized premises was significantly correlated with reasoning accuracy in Experiment 2.

The fact that not only high-prejudice but also low-prejudice participants showed longer study times for incongruent than congruent information is indicative of the possibility that even low-prejudice participants, although engaging in rule-based reasoning, are sensitive to stereotypic implications between targets and nontargets. Stereotypic knowledge might be automatically activated in these participants, to be later dismissed in order to follow more controlled processing (Devine, 1989). Such a more complex (i.e., time-consuming) process would also be in line with our observation of longer study times overall in low-prejudice as compared with high-prejudice participants.

As noted before, in Experiment 2, the accuracy of high-prejudice participants’ relational memory and reasoning for nontargets was inferior to their accuracy in Experiment 1, and this time, the influence of prejudice on reasoning accuracy about nontarget persons was fully mediated by differences in relational memory about nontarget persons. In contrast to Experiment 1, more rapid study time shown by high-prejudice participants influenced neither relational memory nor reasoning about nontarget persons. Most probably, in partially stereotype-incongruent task situations as in Experiment 2, the attentional focus of high-prejudice participants was fully devoted to analyzing the puzzling, sometimes stereotype-inconsistent relations involving the target, whereas relations between nontarget persons were largely ignored.

GENERAL DISCUSSION

Extrapolating from dual-process models of thinking and reasoning (Evans & Over, 1996; Sloman, 1996; Stanovich & West, 2000), we formulated and examined several hypotheses about high-prejudice and low-prejudice individuals’ processing strategies in contexts where they learn about differences between targets and nontargets of prejudice. Our aim was to present novel empirical evidence showing that high-prejudice participants often rely on an associative system of reasoning (fast and simple) in stereotype-evoking contexts, whereas low-prejudice participants in such contexts tend to rely more on formal logic, applying rule-based ways of reasoning.
Across two studies, we found that high-prejudice participants studied the presented relations significantly faster than low-prejudice participants. This prediction was based on the assumption that associative processing, as employed by high-prejudice participants in the stereotype-salient context, should be faster than the rule-based transitive reasoning, which was employed by low-prejudice participants. Furthermore, in both studies, we found the predicted interactions between prejudice (high-prejudice versus low-prejudice participants) and target (relations involving prejudice target versus nontarget persons) in terms of memory accuracy and transitive reasoning. Among high-prejudice individuals (but not among low-prejudice participants), memory accuracy and reasoning involving nontarget persons were impaired in comparison with the same processes involving target persons. On the other hand, among low-prejudice participants, we predicted and found in both studies that the distinction between target and nontarget persons in the transitive reasoning task was irrelevant. These participants were assumed to use more abstract, rule-based ways of reasoning. In line with predictions, low-prejudice participants exhibited the same, relatively high, levels of accuracy for memory and reasoning measures when tested on relations that involved target or nontarget persons. The aforementioned pattern of findings is in line with abundant evidence indicating that, for high-prejudice people, categorization of the stereotyped target person works quickly and effectively, by making associated cognitive and emotional representations immediately accessible (Fiske, 1998; Fiske et al., 1999; Fiske & Neuberg, 1990).

We also found evidence that the mechanism for these effects is subtly altered by the predominance of stereotype-congruent versus incongruent information. In Experiment 1, high-prejudice individuals seemed to infer the (top) position of target person from their salient stereotype because, they exhibited, there was no reliable correlation between the correctness of memory for premises and the accuracy for transitive reasoning (in contrast to the low-prejudice individuals). However, in Experiment 2, we found that high-prejudice participants inferred the position of the target person in transitive reasoning in a more rule-based way, and for both high-prejudice and low-prejudice participants, the accuracy of reasoning concerning target persons was correlated with the accuracy of memory for the presented premises of such reasoning.

An Auxiliary Experiment

An alternative prediction might be that stereotypical content of relations between target and nontarget persons is not necessary because just the presence of a particular target (German) person may automatically activate negative stereotypes (about Germans) and thus interfere with reasoning processes among high-prejudice participants. To examine this prediction, we conducted an additional experiment with exactly the same number of high-prejudice and low-prejudice participants as in Experiment 1. This time, we presented neutral relations (e.g., taller, faster, older) between one target person (German) and three nontarget ones. In contrast to the significant findings of Experiment 1, this auxiliary experiment did not observe any significant differences between high-prejudice and low-prejudice participants’ attention, memory, and reasoning processes. Therefore, a salient stereotypical, relational context appears to be necessary to obtain reliable differences in the information processing of high-prejudice and low-prejudice participants.

Associative Processing Might be Efficient in Stereotype-Congruent Contexts

The obtained pattern suggesting the prevalence of associative forms of reasoning among high-prejudice participants (especially evident in the stereotype-consistent context of Experiment 1) does not mean that those participants were inferior to low-prejudice participants in all aspects of information processing concerning target and nontarget persons. To the contrary, our findings showed that high-prejudice participants spent significantly less time studying the relations involving target persons than low-prejudice participants, while maintaining equal accuracy when memorizing previously presented relations that did involve the target person. This pattern of findings supports the notion that stereotypes and prejudices are sometimes efficient knowledge structures (Macrae et al., 1994a; Sherman, 2001; Sherman & Frost, 2000; Sherman et al., 1998), especially in stereotype-consistent contexts.

Interestingly, the efficiency of high-prejudice individuals in processing information about target persons might be analogous to the processing efficiency in unanxious people within the Eysenck and Calvo conceptualization (1992) of the influence of anxiety on complex task performance. Their model proposes a distinction between effectiveness and efficiency. Effectiveness refers to the quality of task performance, mostly defined as the accuracy of performance. Efficiency refers to the effort invested in the task performance. Supporting this model (for a recent review, see Eysenck, Derakshan, Santos, & Calvo, 2007), anxiety often impairs processing efficiency on complex tasks (longer correct response time) to a greater extent than it impairs performance effectiveness (similar and small proportion of errors). In this sense, high-prejudice individuals were more efficient and similarly effective in processing the information about the relations with target person—less time was needed by them than by low-prejudice individuals for a similar (and nearly perfect) memorizing of the presented relations concerning the target person.

These findings are also consistent with research about the role of cognitive structure on stereotyping (Bar-Tal & Guinote, 2002). Namely, high-prejudice participants in the current research seemed to present the need and ability to achieve cognitive structure about target persons by their employment of rapid processing, clearly differentiated categories, and black–white solutions. On the other hand, low-prejudice participants appeared to be lower in the need and ability to achieve cognitive structure, in terms of their adopting a more “piecemeal” and systematic (more time-consuming) processing strategy (Bar-Tal, Kishon-Rabin, & Tabak, 1997; Fiske & Pavelchak, 1986).

Processing of Information about Target and Nontarget Persons: Emotional-Binding Account

Although our evidence supported the distinction between two ways of reasoning and its usefulness for explaining individual
differences in negative prejudice and reasoning, we are aware of the increasing criticism concerning the overuse of dual-process models as universal explanations of many psychological mechanisms (Keren & Schul, 2009; Kruglanski & Webster, 1996). Therefore, alternative explanations of the obtained evidence should be examined, even if these may be seen as somewhat speculative.

Interestingly, one might offer an alternative, emotionally driven theoretical explanation for the obtained pattern concerning the processing of target and nontarget persons. Specifically, the effects of prejudice and group membership (i.e., target versus nontarget status) might be derived from the theoretical concept of emotional interference in memory binding (Mather, 2007; Mather et al., 2006; Reisberg & Heuer, 2004). According to this account, targets of prejudice (e.g., Germans) attract more attention than nontarget persons (e.g., Poles), especially in participants who are highly prejudiced. Consequently, maintenance of information in working memory and reasoning accuracy with regard to nontarget persons might be substantially impaired among high-prejudice participants. In our data, however, study times for target and nontarget information did not differ (except simple transitive reasoning in Experiment 1, see Figure 2). Thus, this alternative explanation does not seem fully applicable to the results we obtained. Further research utilizing psychophysiological designs would help to compare/reintegrate more precisely the explanations for the negative influence of prejudice on memory in terms of dual models of reasoning, vis-à-vis competing explanations in terms of interfering emotional bindings.

CONCLUSIONS

Extant approaches in social cognition research (see for reviews, Brewer, 1988; Fiske & Neuberg, 1990; Diehl & Jonas, 1991) link stereotypes or prejudice to some forms of inference. These approaches typically refer to top-down processes of an inductive form of conditional reasoning (if p then q) about the attributes of a typical target person (e.g., “If Jim is a typical African-American, then he is musical”). Our research is novel in both respects: (i) it is based on formally defined transitive reasoning (as pertinent to linear orders) and (ii) the reasoning concerns not only target but also nontarget persons. Additionally, we applied the original questionnaire-plus-recall memory assessment that integrates linguistic and memory approaches and provides a novel method for examining prejudice. However, further research is needed to show advantages or disadvantages of this method in comparison with other measures of prejudice, for example, a semantic differential scale.

The idea that erroneous group stereotypes might be formed by biased reasoning was elaborated in several research domains, including illusory correlations (Garcia-Marques & Hamilton, 1996; Hamilton & Gifford, 1976), incomplete statistical processing of spurious correlations (Schaller, 1992), or more recently about “pseudocontingencies” (Fiedler, 2000; Meiser & Hewstone, 2004). The current research tackled the problem from the opposite direction: assuming that there exist individual differences in prejudice toward a given social category, we formulated and examined novel predictions about the influence of prejudice on relational memory and on transitive reasoning processes in a stereotype-salient context, thereby indicating the importance of a clear distinction between interpersonal relations that involve stereotype targets and relations that only involve nontarget persons.

The results contribute new and somewhat counterintuitive findings to the psychological area of prejudice and stereotypes. Prejudice might facilitate the processing of information about prejudice-relevant target persons but at the same time might substantially impair the memory and reasoning processes about nontarget persons. These results underscore the necessity of a broader scope in research, including social contexts and social groups that might consist of target and nontarget persons, in order to better understand the cognitive and emotional processes among high-prejudice and low-prejudice people. In conclusion, we argue that the distinction between an associative and a rule-based form of transitive reasoning in stereotype-salient contexts, clearly differentiating high-prejudice from low-prejudice participants, might stimulate new research programs, integrating research on mental models of strictly logical reasoning with the social cognition domain.

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