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Illusory correlation and cognitive processes: A multinomial model of source-monitoring

FRANCESCO BULLI and CATERINA PRIMI

The present research examines how the application of a multinomial source-monitoring model in the illusory correlation paradigm (Klauer & Meiser, 2000) can shed light on the cognitive processes underlying illusory correlation paradigm in children. A source-monitoring analysis allows the assessment of the roles of different factors (item memory, source memory and response bias) involved in the illusory correlation. In line with the previous source-monitoring analyses on adults (Klauer & Meiser, 2000; Meiser & Hewstone, 2001), illusory correlation phenomenon was caused by the guessing bias in source discrimination: a larger proportion of positive than negative behaviors was attributed to the majority group in a state of memory uncertainty. The results are discussed in terms of previously proposed theories of illusory correlation paradigm.

Key words: illusory correlation, source-monitoring, multinomial processing tree

The formation of illusory correlation is a mechanism of stereotype development which has largely been studied in adults, but until recently has not received attention from a developmental standpoint. Illusory correlation refers to an erroneous inference about the relationship between the two categories of events that are not correlated or are correlated to a lesser degree than one perceives (Chapman, 1967). In the classic illusory correlation paradigm (Hamilton & Gifford, 1976, Experiment 1) people read 26 statements describing the behaviors of individuals belonging to a group (A) and 13 statements describing behaviors of individuals belonging to another group (B). Although the ratio of favourable to unfavourable behaviors was the same for both groups, people perceived an association between the minority group (numerically smaller) and behaviors occurring less frequently (undesirable behaviors). Specifically, an illusory correlation was observed on three measures: a) Group B received less favourable evaluative ratings, b) an inflated number of previously presented negative behaviors was assigned to Group B in the assignment task, and c) the frequency of negative behaviors in Group B was overestimated, whereas the estimated frequency of negative behaviors in group A was more correct.

Distinctiveness-based account. Hamilton and Gifford (1976) explained the effect of illusory correlation in terms of the biased encoding of infrequently occurring information. The co-occurrence of infrequent, and therefore distinctive, events was supposed to draw particular attention and to lead to better encoding. That is, members of the minority Group B performing undesirable behaviors should be particularly salient, and the increased attention to these distinctive and paired events should result in deeper encoding of the relationship between the minority group and negative behaviors. As a result, these events are assumed to be particularly well represented in memory, leading to the enhanced availability at retrieval (Hamilton, Dugan, & Trolier, 1985) and, thereby, to biases in judgments (Tversky & Kahneman, 1973).

Illusory correlations in children. Despite two decades of research on illusory correlation in adults and the important implications of this phenomenon for understanding the development of stereotypes, research on the development of illusory correlation in children has just begun to emerge. To investigate illusory correlations in children, Primi and Agnoli (2002) followed Hamilton and Gifford's paradigm but adapted it to the capacities of children. Participants were shown drawings of 15 positive behaviors and 6 negative behaviors performed by members of a majority group, called Pines, or a minority group, called Firs. There were 10 descriptions of desirable behaviors ascribed to members of Group Pines, whereas 4 statements specified undesirable behaviors of Group Pine members; in Group Firs, there were 5 desirable and 2 undesirable behaviors; thus, the ratio

Francesco Bulli, Department of Psychology, University of Florence, Italy. E-mail: francescobulli@hotmail.com;

Caterina Primi, Department of Psychology, University of Florence, via San Niccolò 89, 50125 Firenze, Italy. E-mail address: cprimi@texnet.it (the address for correspondence).

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of positive to negative behaviors was the same (5:2). After viewing all 21 drawings, participants performed three tasks similar to those used by Hamilton and Gifford (1976), yet simpler. They rated each of the groups on many qualitative dimensions (evaluation task). They attributed behaviors to the minority or majority group by placing a drawing depicting each behavior in a majority-group box or a minority group-box (assignment task). Finally, they estimated the frequency of negative behaviors by removing cards from a stack (estimation task). Primi and Agnoli reasoned that if illusory correlation is due to an information processing bias in which shared infrequency makes minority-negative behaviors more salient, then children should form the illusory correlation similar to adults.

All three tasks provided consistent evidence that children also perceive the illusory correlation. Participants rated the majority group significantly higher than the minority group on the evaluation task. They significantly overestimated the number of minority group members who behaved badly, resulting in a significant correlation of group membership and the type of behavior. They also overattributed negative behaviors to the minority group. Interestingly, children remembered the items comprising the negative behaviors assigned to the minority group above chance level. These data are congruent with adults' models of illusory correlation positing that distinctive information is salient, receives more encoding and becomes more accessible in later judgments (Hamilton & Sherman, 1989; McConnell, Sherman, & Hamilton, 1994).

Another study in line with the distinctiveness-based explanation is the one by Johnston & Jacobs (2003). The goals of this study were to provide a conceptual replication of Primi and Agnoli's (2002) findings of an illusory correlation between a minority social group and negative behaviors and to extend the investigation by including conditions in which both positive and negative behaviors are infrequent. In addition, the authors explored the role of memory for specific group-behaviors pairs.

Johnston and Jacobs (2003) showed participants a series of stimulus items, each of which described a member of one of two groups of fictitious children ("blue" group or "red" group) exhibiting either a positive (e.g., making good grades) or a negative (e.g., cheating at games) behavior. The majority group was twice as large as the minority group. In fact, the terms majority and minority refer only to the relative size of the groups and not to social categories, such as sex or ethnicity. The proportion of items describing positive and negative behaviors was the same for each group (2:1). Besides completing three standard tasks to assess their perceptions of illusory correlation between group membership and behavior type, children in this study were measured on verbal memory. This experiment provided evidence that children are indeed susceptible to illusory correlation between minority groups and infrequently occurring behaviors.

Both Primi and Agnoli (2002) and Johnston and Jacobs (2003) showed that children, like adults, remembered better the cell containing the statistically infrequent data, suggesting that these infrequent stimuli were more salient or distinctive to participants.

Overview of the present experiment. The present article investigates how the application of a multinomial source-monitoring model to the illusory correlation paradigm (see Klauer & Meiser, 2000) in children can shed light on the cognitive processes underlying illusory correlations. To apply a multinomial model of source-monitoring to the illusory correlation paradigm the assignment task was considered as an instance of so-called source-monitoring.

Source-monitoring concerns the ability to remember the origin of information acquired earlier and it is a popular research area that has been applied to many issues, including eyewitness memory, aging and amnesia (see Johnson, Hashtroudi, & Lindsay, 1993, for a review). In a typical source-monitoring experiment, participants are presented with items that come from two different sources. This is followed by a memory test in which subjects are presented with old items and new distractors and have to identify not only which items were originally showed, but also the source of these items.

Conventional empirical measures of source-monitoring are frequently misleading and problematic to interpret: in fact they confound memory item memory and source memory and they cannot separate the source sensitivity from the response bias with regard to the source (Batchelder & Riefer, 1990). Multinomial models of source monitoring suggest solving this problem by providing independent, theoretically motivated, parameters for the measurement of different factors (item memory, source memory and response bias) that can contribute to performance in a source-monitoring task (Bayen, Murnane, & Erdfelder, 1996).

Therefore a source-monitoring analysis of the assignment task allows one to disentangle memory and guessing processes in item recognition and source attributions and, thus, to assess the roles of different memory processes and response bias involved in the illusory correlation. Particularly, the capability of the source-monitoring theory to account for both types of memory independently (item memory and source memory) allows one to agree or reject the assumption that illusory correlation is mediated by a selective advantage of the twice infrequent events.

METHOD

Participants

A total of 158 children (*M* age = 10.8; *SD* = 1.7) participated, ranging from 8 to 13 years of age. The children were from a public elementary school and a public middle school

Table 1
Distribution of behaviors (from Primi and Agnoli (2002) experiment)

	Majority/Pines	Minority/Firs	Total
Positive behaviors	10	5	15
Negative behaviors	4	2	6
Total	14	7	21

in the Tuscany region of Italy. The participants included 78 boys and 80 girls.

Materials

The material was similar to the Primi and Agnoli (2002) experiment. A list of 21 statements formed the stimulus items. Each stimulus item consisted of initials, a group designation (Pines or Firs) and a behavior (positive or negative). For example, "*R. from the Pines group throws rocks at animals* ".

Arbitrarily, the Pines group was labelled as larger or a majority group and the Firs group was labelled as the minority group: two-thirds of the children in the sentences were Pines (14) and one-third were Firs (7). In both groups, the ratio of positive to negative behaviors was the same - 5:2. Table 1 summarizes the number of positive and negative behaviors for both groups.

In order to analyse the illusory correlation paradigm and particulary the group attribution task as an instance of source-monitoring, we prepared an additional 21 stimuli. These items were based on interviews of children about good and bad behaviors. Ninety-five children (3rd to 7th grade) were interviewed individually. Each child was asked to imagine a child whom everyone would like, and describe his/her good behavior. Then each child was asked to imagine a child whom everyone would dislike, and describe his/her bad behavior. Of the 21 most frequently cited behaviors, 14 positive behaviors and 7 negative behaviors were selected.

Procedure

Participants were tested individually in a quiet area of their school. All stimuli and tasks were presented on the screen of a personal computer by means of Flash MX software[1]. Each session lasted for about 20 minutes.

Method and instructions followed the Primi and Agnoli (2002) experiment. Participants were told that they "*shown on the computer screen they were about to see the sentences in which kids did certain thing; the kids belonged to two groups, one called Pines and the other called Firs*". The order in which group names were mentioned was randomized. Each participant looked at a sample sentence that included the initials of a child and his/her behavior. In this example no group name appeared next to the initials; participants, however, were alerted that each child would be associated with either Pines or Firs group.

The 21 stimulus items were then presented on the computer monitor with a duration of 7 seconds, and in a randomized order for each participant. The experimenter read aloud the name, the membership group and the sentence describing a behavior. After viewing all 21 stimuli, participants performed three tasks: 1) an evaluation task, 2) a source-monitoring task, and 3) a frequency estimation task. The order of presentation of the evaluation task and the group attribution task was counterbalanced. The frequency estimation task, instead, was always performed last for comparison with the studies of adult illusory correlation in which this task was always last.

Evaluation task

Participants were asked to rate the majority and minority groups with the respect to 14 pairs of bipolar adjectives. The adjectives were taken from Primi and Agnoli (2002). For each trait adjective a scale ranging from 1 (clicking next to the left word) to 5 (clicking next to the right word) was provided on the computer screen. The participants entered their responses by mouse clicks and they first rated one group on all of the adjective-pairs, then the other group, with the order of groups counterbalanced across participants.

Source-monitoring task

Unlike the Primi and Agnoli (2002) experiment, the assignment task was extended to a source-monitoring task with new behavior descriptions used as distractor items. Target items and distractors were drawn from a common pool of items.

The 14 positive and 7 negative target behaviors from the presentation phase (without group membership) were represented together with 14 positive and 7 negative distractor items that had not been presented before. Targets and distractors were shown in a random order that was determined for each participant anew. For each item, participants were first asked to decide whether the item was one they saw displayed during the presentation phase (response "yes") or whether the item was new (response "no"). They entered their responses by clicking on an appropriately labelled button on the computer screen. If the participants responded "yes", then they also had to indicate the item's group origin (Pines or Firs) in a second step. Participants' instructions

1 The use of personal computer was a difference compared with Primi and Agnoli (2002) experiment. Therefore, in the pilot study we examined weather the use of computer would effect the illusory correlation phenomenon and found no difference among the procedures.

were made to ensure that the item detection choice (deciding yes or no) and the source discrimination choice (deciding Pines or Firs) were treated as separate decisions (Klauer & Meiser, 2000).

Frequency estimation task

In this task, participants were presented the total number of members belonging to each of the two groups. They were instructed to drag into a basket as many members as the number of children who had performed negative behaviors. The presentation order of the two groups was randomized.

RESULTS

Evaluation task. If participants perceive an illusory correlation between group membership and behavior, they should rate the majority group (Pines) more positively than the minority group (Firs) on evaluative traits. The ratings were coded so that larger values corresponded to the better evaluations. They were then averaged for each participant, separately for the Pines and Firs groups. As expected, members of group Pines received better evaluations ($M = 3.5 \pm 1.0$) than did members of group Firs ($M = 3.1 \pm 1.1$) and this difference was significant ($t(157) = 3.4$, $p < .01$).

Source-monitoring task. The assignment frequencies of target items and distractors were calculated separately for positive and negative behaviors. Participants had three response alternatives in the assignment task, resulting in two 3 × 3 frequency tables, one for positive behaviors and the other for negative behaviors. Table 2 and Table 3 show the data matrices for the source-monitoring task.

Table 2
Data matrix for the source-monitoring task for positive behaviors

	Response			
Source	Pines	Firs	New	Total
Pines	689	413	478	1580
Firs	326	257	207	790
New	98	75	2197	2370
Total	1113	745	2882	4740

Table 3
Data matrix for the source-monitoring task for negative behaviors

	Response			
Source	Pines	Firs	New	Total
Pines	307	269	56	632
Firs	125	151	40	316
New	18	16	914	948
Total	450	436	1010	1896

Of the positive behaviors, 1113 (23.5%) were assigned to group Pines and 745 (15.7%) to group Firs. In contrast, of all the negative behaviors, 450 (23.7%) were assigned to group Pines and 436 (23.0%) to group Firs, indicating an illusory correlation between the group membership and the type of behavior. The ratios of assignments to Group Pines versus Firs were significantly different for positive and negative behaviors, as shown by χ^2 test for equality of proportions ($\chi^2(1) = 20.3$, $p < .0001$).

The assignment frequencies were analyzed using multinomial two-high threshold model of source-monitoring (Bayen, Murnane & Erdfelder, 1996). Two-high threshold models allow for both, the recognition of target items as old and the identification of distractor items as new. Figure 1 shows processing-tree representation of the source-monitoring model adapted for the illusory correlation paradigm on children.

The model assumes that participants' responses to items in a source-monitoring task are a function of a series of hypothetical cognitive processes: item detection (parameters D_1, D_2, D_3), source discrimination (parameters d_1, d_2), and two response biases (parameters a, b). The model is represented by three processing trees, one for each of the three sources of behaviors, that is, behaviors referring to members of group Pines, those referring to Firs members and new behaviors.

The model assumes that participants detect whether an item is old with D_1 probability for group Pines behaviors, D_2 for group Firs behaviors. With the D_3 probability, the distractor items are correctly discriminated as new items. If an old item is detected as old, then d_1 and d_2 measured the capacity to discriminate the source of old Pines and Firs behaviors, respectively.

If discrimination of the source of an old item fails (with a probability $1 - d_i$, $i = 1, 2$), then only a guessing process, measured by parameter a, determines the source assignment. With an a probability, the item is assigned to group Pines; with a complementary probability $1 - a$, the item is assigned to group Firs.

If item memory fails (with a probability $1 - D_i$, $i = 1, 2, 3$), the model assumes that participants can guess whether the behavior is old or new. The probability of guessing old is given by the bias parameter b. If participants guess that the behavior is old, the same guessing process (measured by parameter a) determines which source the item is assigned to. With an a probability, the item is assigned to group Pines; with a complementary $1 - a$ probability, the item is assigned to group Firs. If, on the other hand, participants guess that the item is new, they respond "new" with a probability of $1 - b$.

The model is designed to represent situations in which an observed response category can arise from one or more unobserved cognitive steps, corresponding to branches in the tree

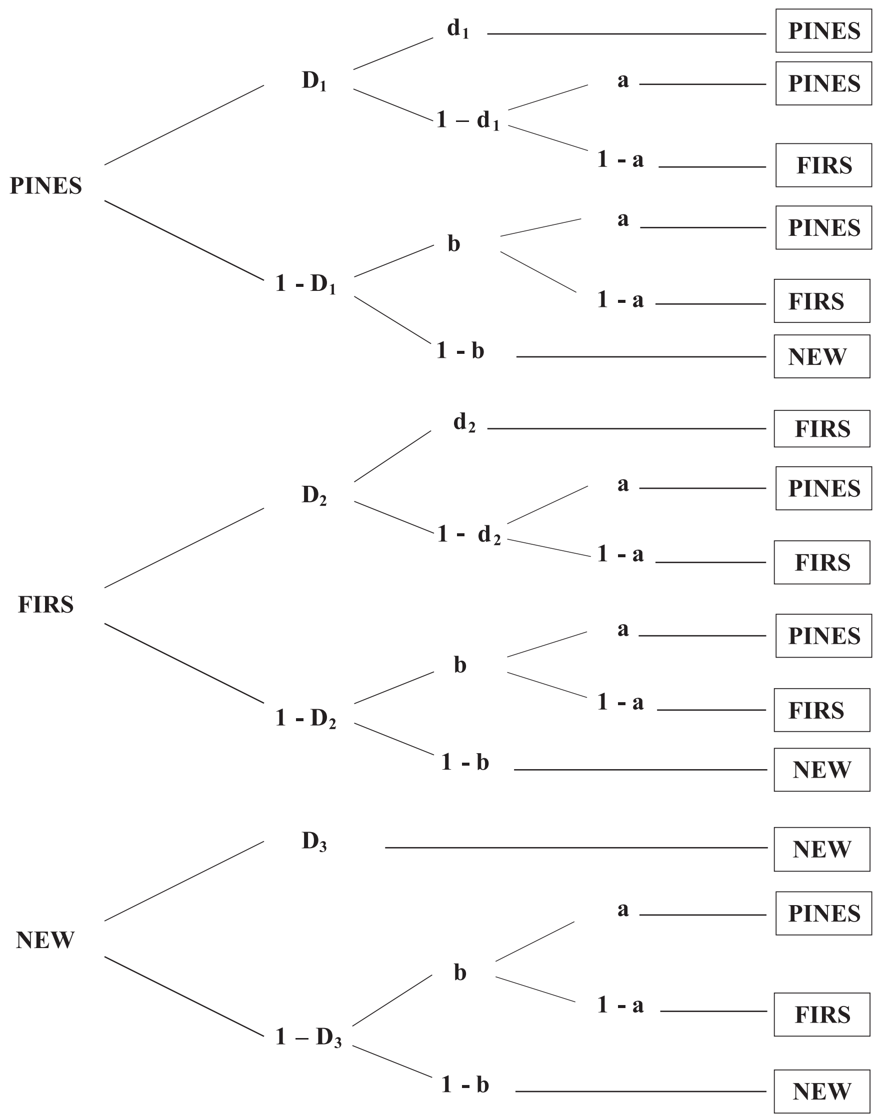

Figure 1. Two-high threshold multinomial model of source monitoring applied to the illusory correlation paradigm on children

Note. Pines = group Pines behaviors; Firs = group Firs behaviors; New = distractor behaviors. The actual group membership is displayed on the left; the response categories are displayed in the rectangles on the right. D_1 = probability of detecting an item from group Pines as old; D_2 = probability of detecting an item from group Firs as old; D_3 = probability of detecting a distractor as a new; d_1 = probability of correctly discriminating the source of an item from group Pines; d_2 = probability of correctly discriminating the source of an item from group Firs; *a* = probability of guessing that a detected or undetected item is from group Pines; *b* = probability of guessing an item is old.

structure. Each cognitive process occurs with a defined probability and the probabilities of cognitive steps are represented by the model parameters. Thus, the multinomial model can be described as a system of equations, in which response category probabilities are generally expressed as nonlinear functions of the underlying psychological parameters.

In fitting the multinomial source-monitoring model to the data, the separate parameters for positive and negative items were used. The model in Figure 1 has a total of 14 parameters (7 for each data matrix). The two data matrices provide 2 × 6 = 12 degrees of freedom, so that the model is overparametrized and then it is technically nonidentifiable. A way to handle the nonidentifiability problem is to impose restrictions on the parameters.

A restriction of interest (Bayen, Murnane & Erdfelder, 1996) is to assume that $D_1 = D_2 = D_3$ for both negative as well as positive items. The restriction includes the assumption made for two-high threshold models that the probabilities of correctly identifying targets and distractors are equal. Therefore, we began by setting $D_1 = D_2$ for positive and negative items, that is testing the statistical hypothesis that the probability of responding "new" for a group Pines item is the same as the probability of responding "new" for a group Firs item. This test can be performed using the χ^2 test of equality of independent proportions. The hypothesis $D_1 = D_2$ of equal item memory could not be maintained for the subtable with positive behaviors ($\chi^2(1) = 4.21$, $p = .04$). For the subtable with negative behaviors, the χ^2 test of equality of independent proportions was not statistically significant ($\chi^2(1) = 3.34$, $p = .06$). It was right, however, to assume that the hypothesis of equal item memory could not be maintained for negative behaviors, too.

So in all models reported below we had to keep the parameters D_{1+} ; D_{2+} ; D_{1-} ; D_{2-} separate, that assumed the following values respectively .70; .74; .91;.87[2]. Looking at these probabilities, it is clear that D_{2+} (item memory for group Firs positive behaviors) is higher than D_{1+} (item detection for group Pines positive behaviors). Item discrimination for new positive behaviors, D_{3+} (.93), appears to be quite good. Likewise D_{1-} is better than $D2_-$, again D_{3-} is good (.96). This prompted us to fit a model with two restrictions: $D_{2+} = D_{3+} = D_+$ and $D_{1-} = D_{3-} = D_-$. This model was identifiable (i.e., the parameters can be estimated), and saturated $G^2(0) = .00005$.

We proceeded in a hierarchical search of a nested model with the better goodness of fit. The restrictions $D_{2-} = D_-$ and $D_{1+} = D_+$ could not be maintained. The loss in goodness of fit entailed by imposing these restrictions was significant ($\Delta G^2(2) = 7.48$, $p = .02$). The item memory parameters for positive items was smaller than that for negative items, indicating a negativity effect in memory similar to that found in adults (Klauer & Meiser, 2000; Meiser & Hewstone, 2001).

We tried a model in which all four source discrimination parameters were set equal to one common value d (in addition to the above restrictions on the item memory parameters), on the grounds that this restriction was possible in previous works (Bayen, Murnane & Erdfelder, 1996; Klauer & Meiser, 2000; Meiser, 2003; Meiser & Hewstone, 2001). The four source memory parameters could be set equal without a significant loss in goodness of fit ($\Delta G^2(3) = .89$, $p = .83$), indicating that there was no differential source memory. The overall source memory parameter, $d = .08$, was significantly different from zero as shown by its 95% confidence interval (.04, .12).

The response bias parameter b was not different for positive and negative behaviors. The attempt to set the b parameters equal for positive and negative behaviors did not yield a significant loss in goodness of fit ($\Delta G^2(1) = 2.53$, $p = .11$).

Finally, the guessing bias in source discrimination (parameter a) showed an evaluative bias in that the tendency to assign positive items to group Pines (majority) is larger than the tendency to assign negative items to the same group, and the difference was significant ($\Delta G^2(1) = 21.56$, $p < .0001$).

Based on this pattern of significances, a simplified model was fitted to the empirical assignment frequencies shown in Table 2 and Table 3. The goodness of fit of the model was tested with the likelihood ratio G^2 (Hu & Batchelder, 1994), which is asymptotically chi-square distributed with four degrees of freedom. Specific hypotheses were estimated using the conditional likelihood-ratio statistic ΔG^2. The critical value of the rejection of the model was determined by a statistical power analysis. This procedure was chosen to avoid the risks related to the use of conventional levels of significance in the goodness of fit tests (Erdfelder, Faul, & Buchner, 1996). The power analysis was conducted with the software GPOWER (Erdfelder et al., 1996) for 6636 observations (i.e. 42 responses from 158 participants), small effect size ($\omega = .10$), four degrees of freedom, and equality of the statistical error probabilities α and β. The power analysis yielded a critical value of $G^2_{crit.}(4) = 22.69$, corresponding to the error probabilities $\alpha = \beta = .0001$. The empirical likelihood ratio was much smaller, $G^2(4) = 3.42$, $p = .49$, indicating an acceptable goodness of fit. Table 4 shows the resulting parameter estimates and their 95% confidence intervals.

Table 4

Parameter estimates and 95% confidence intervals for the final model of source-monitoring

Parameter	Final Model Estimate	IC (95%)
D_+	.67	(.63, .71)
D_-	.87	(.85, .89)
D_{1+}	.61	(.57, .65)
D_{2-}	.84	(.80, .88)
d_1	$.08_a$	(.04, .12)
d_{2+}	$.08_a$	(.04, .12)
d_{1-}	.49	(.04, .12)
d_{2-}	$.08_a$	(.04, .12)
b_+	$.23_b$	(.19, .27)
b_-	$.23_b$	(.19, .27)
a_+	.60	(.58, .62)
a_-	$.08_a$	(.45, .53)
	$G^2(4) = 3.42$	

Note. 1 = group Pines; 2 = group Firs; + = positive behaviors; - = negative behaviors; D_+, D_-, D_{1+}, D_{2-} = item detection parameters; d_{1+}, d_{2+}, d_{1-}, d_{2-} = source discrimination parameters; a_+, a_- = probability of guessing group Pines; b_+, b_- = probability of guessing that an item is old. Parameter estimates with the same subscript were restricted to be equal.

2 Item detection parameters D_n (n=1, 2, 3) are the only parameters that may be calculated from data matrices for the source-monitoring task ($D_1 = 1 - p_{13}$; $D_2 = 1 - p_{23}$; $D_3 = p_{33}$).

Frequency estimation task. If participants perceive an illusory correlation between the group membership and the behavior, they should overestimate the frequency of negative behaviors associated with the minority group. Participants had to estimate how many children in the majority and minority groups were engaged in negative behaviors. Participants estimated an average of 4.97 members from the group Pines and 3.68 members from the group Firs. To evaluate the strength of the illusory correlation, we calculated a phi correlation coefficient for each participant. Averaging across all participants, mean phi equalls .17 and is significantly greater than zero ($t(157) = 7.41$, $p < .0001$). The participants' estimates were consistent with the illusory correlation paradigm.

DISCUSSION AND CONCLUSION

All three tasks in this experiment provided consistent evidence that children perceive illusory correlation. Participants rated the majority group (Pines) significantly higher than the minority group (Firs). They significantly overestimated the number of minority group members who exhibited negative behaviors, resulting in a significant correlation between group membership and the type of behavior. The group attribution task differed slightly from the standard procedure. The assignment task, as an example of a source-monitoring task, allowed the investigation od the roles of different memory processes and response bias involved in the illusory correlation paradigm, by means of a multinomial model.

With respect to item memory, a negativity bias was observed so that there was a memory advantage for negative behaviors, similar to that pointed out in adults (Klauer & Meiser, 2000; Meiser & Hewstone, 2001). The reason may be that negative behaviors are inherently more salient than positive behaviors, therefore, attracting more attention than positive behaviors (Johnston, 2000). The negativity effect in memory is by itself not enough to explain the illusory correlation. In contrast to what might be expected on the basis of the distinctiveness-account there was no better memory for the doubly infrequent negative minority group behaviors (parameter D_{2-}).

With regard to source memory, no reliable differences were found as a function of the group origin and the type of behavior. In fact, the four source memory parameters (d_{1+}, d_{2+}, d_{1-}, d_{2-}) could be set equal without significant loss of goodness of fit. Thus the observed illusory correlation in the assignment task is caused neither by the differential item memory, differential source memory, nor a combination of both.

Ruling out the possibility that the illusory correlation was caused by memory processes, we analyzed the guessing processes. As to parameter b (probability of guessing that an item is old) no differences were found as a function of the desirability of the behavior. Rather, illusory correlation effect could be traced back to differential response bias in a source discrimination (parameter a) for positive and negative behaviors. When guessing the origin of a positive behavior, participants chose majority group (group Pines) rather than minority group (group Firs) with the probability .60; when guessing the origin of a negative behavior, participants chose group Pines with a significantly smaller probability (.49).

How can the observed results be reconciled with the distinctiveness-based account? The distinctiveness account is questioned by the finding that illusory correlation occurs without the differential recognition or the source memory for the twice infrequent negative minority group behaviors (D_{2-} and d_{2-} parameters). In contrast to earlier research in children (Johnston & Jacobs, 2003; Primi & Agnoli, 2002) emphasizing the assumption that illusory correlation effect is mediated by a selective memory advantage of the twice infrequent events, we viewed the guessing bias involved in the source discrimination as in itself sufficient to create correlations between group membership and type of the behavior, even when they were non existant. If the distinctiveness-based account appears to gain less support, the present experiment could be accommodated by the information loss hypothesis (Fiedler, 1991). Fiedler argued that illusory correlation could arise because different amounts of information - about the proportion of positive and negative behaviors - describe majority and minority groups. It is the asymmetry in the frequency table itself, rather than the cognitive distinctiveness, that creates the illusory correlation effect.

According to Fiedler (1991), unless information is processed without error, estimates of frequency will show regression to the mean that is even stronger with the smaller sample because of the "law of large numbers". This universal statistical principle argues that with increases in the size of the sample (n), sample mean distribution variability ($\sigma^2_M = \sigma^2 / n$) is decreases untill it vanishes, or rather the sample mean becomes more representative of the population mean and sample mean agrees with population mean when $n = N$.

Although the ratio of positive to negative behaviors is the same for the majority group (10:4) and the minority group (5:2), there are twice as many observations to learn the correct proportion of frequencies in the former than in the latter case. The differential loss of information for the majority and minority groups should result in judgments that minority group is less positive than majority group when most behaviors are desirable (i.e. the typical illusory correlation effect). This effect emerges, however, without any differential processing of the infrequent items. Therefore, the lack of memory advantage for the minority group negative behaviors (as our experiment makes it clear) could be in line with the information loss hypothesis.

According to information loss account, illusory correlation reflects memory impairment for the correct reproduction of proportions at the group level and does not pertain directly to memory for specific items. Thus, participants who correctly assigned more positive items to the majority group than to the minority group may not remember a single item but merely rely on guessing, having noticed that positive items are associated with the majority group (Fielder, Russer, & Gramm, 1993).

We conclude that a source-monitoring analysis of illusory correlation paradigm on children casts doubt on the distinctiveness account, and furthermore, on the possibility that the illusory correlation effect results from the increased salience of co-occurring distinctive stimuli.

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