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Article *in* Journal of Personality and Social Psychology · November 2002

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Journal of Personality and Social Psychology
2002, Vol. 83, No. 4, 817–827

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0022-3514/02/$5.00 DOI: 10.1037//0022-3514.83.4.817

Effects of Social Exclusion on Cognitive Processes: Anticipated Aloneness Reduces Intelligent Thought

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Three studies examined the effects of randomly assigned messages of social exclusion. In all 3 studies, significant and large decrements in intelligent thought (including IQ and Graduate Record Examination test performance) were found among people told they were likely to end up alone in life. The decline in cognitive performance was found in complex cognitive tasks such as effortful logic and reasoning; simple information processing remained intact despite the social exclusion. The effects were specific to social exclusion, as participants who received predictions of future nonsocial misfortunes (accidents and injuries) performed well on the cognitive tests. The cognitive impairments appeared to involve reductions in both speed (effort) and accuracy. The effect was not mediated by mood.

The two most important and powerful adaptations of the human race are intelligence and social structure. Human intelligence, based on a large and powerful brain, is far superior to what has been observed in almost every other species. Human social organization is likewise more complex and flexible than what has been observed elsewhere. Barchas (1986) has proposed that the small social group is the single most important adaptation of human beings, more important even than intelligence, although certainly other theorists would argue that intelligence deserves priority. In any case, it is clear that the human capacity for intelligent, complex thought has enabled people to solve problems and master their environment to an unprecedented extent, and human social groups have likewise contributed immensely to cultural and technological progress, safety and comfort, and individual well-being.

The present investigation was designed to investigate the possible link between social belongingness and intelligent thought. Specifically, we explored the impact of social exclusion on cognitive processes. We led participants to believe that they would be alone in later life, and we measured the impact of this message on cognitive functioning. Practical and ethical constraints prevented us from studying long-term deprivation and potentially permanent changes in intelligence, but we were able to study short-term effects of social exclusion on mental performance. Competing predictions could be generated. From a simple evolutionary perspective, one might assume that it would be highly adaptive for intelligent functioning to increase among people who expect to be excluded from social groups. There is, after all, some overlap (and hence potential redundancy) in the benefits to be gained from social group membership and intelligent thought. To survive, people need to make effective decisions, avoid danger, resolve problems, cope with misfortunes, and obtain life-sustaining resources. Belonging to a group can help one accomplish these, insofar as group members support and protect each other, share resources, and pool information, and a group leadership structure may free many individuals from the burden of making all their own decisions. In contrast, people who do not belong to a group must accomplish these ends on their own, so their need for sharply intelligent functioning is seemingly increased. Put another way, one has to be more intelligent to live by one's own wits than simply to get by with help from one's friends (i.e., by relying on and benefiting from the group). It therefore seems optimal for intelligence to shift into high gear among individuals thrust out from social groups.

A quite different theoretical approach, however, contends that the powerfully intelligent human brain is not a substitute for social group membership but rather a tool for facilitating it. The debate over whether intelligent thought or group sociality is the more important and beneficial human adaptation becomes moot, because the two are intricately linked. In this view, social cognition rather than technical problem solving may be the crucial raison d'etre of human intelligence. Some theorists have emphasized that most or all cognition is socially shared, including the fact that its medium (language) and content (things and events) both refer inevitably to the cultural and social world that is constructed and maintained by groups of people (Resnick, Levine, & Teasley, 1991). Research on work groups has emphasized, for example, that group members construct, communicate, maintain, and pass along bodies of infor-

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mation about the nature and identity of the group, about the members of the group, and about the work tasks (Levine & Moreland, 1991). Even such a seemingly simple task as learning to play baseball is not something that occurs inside one child's head but rather involves learning to participate in a shared understanding of events, and that in turn requires ongoing and complex communication between players, coaches, and others (Heath, 1991).

From this line of reasoning, one could predict that socially isolated individuals should have relatively less use for intelligent thought, whereas a fully functioning intelligence is needed to navigate the complex social structure and dynamics of human communities. If intelligence is designed to help the individual satisfy the need to belong, then being excluded from social groups might cause a reduction or impairment of cognitive functioning.

The impairment hypothesis could be elaborated to involve emotional distress. Assuming that the need to belong is in fact a basic and powerful motivation (Baumeister & Leary, 1995), people would be likely to feel emotional distress when that urge is thwarted. Research on anxiety has repeatedly found social exclusion to be the single most common cause, and, in fact, other than fear of bodily harm, social exclusion is almost the only established major source of anxiety (see Baumeister & Tice, 1990, for review). Researchers studying ostracism have found significant emotional distress among ostracized individuals (Williams, Cheung, & Choi, 2000). Being excluded from social groups might set off anxiety or other forms of emotional distress that could produce a short-term impairment of cognitive functioning.

Despite the plausible hypothesis that emotional distress might mediate a reduction in intelligent thought as a result of social exclusion, the present investigation was actually stimulated by a rising skepticism about the role of emotion after social exclusion. In a series of studies, we found that social exclusion produced substantial increases in aggressive behavior (Twenge, Baumeister, Tice, & Stucke, 2001), decreases in prosocial behavior (Twenge, Ciarocco, & Baumeister, 2001), and increases in self-defeating behavior (Twenge, Catanese, & Baumeister, 2002). We had initially thought that being excluded from social groups would cause severe emotional distress, which in turn would lead to antisocial and self-defeating behavior and various other undesirable outcomes. The behavioral effects were clear and consistent, but the emotional processes failed to play the mediating role we had hypothesized. To be sure, we did usually find that there were some small increases in emotional distress among people who were rejected or excluded by others, but these effects were weak and inconsistent. Moreover, the emotional effects repeatedly failed to mediate the behavioral consequences, as tested by standard statistical tests of mediation (Baron & Kenny, 1986).

Hence, we had to begin entertaining the view that many effects of social exclusion were mediated by something other than emotional distress. Cognitive impairments were a prime candidate. For example, there are many signs that socially excluded or deprived people commit more crimes, such as in the disproportionately high rate of offspring of single parents found in criminal prisons (Gottfredson & Hirschi, 1990). Research also finds that single men commit more crimes than married men (Sampson & Laub, 1990) and that rejected children are more aggressive than popular, accepted children (Newcomb, Bukowski, & Pattee, 1993). Yet studies of criminals have found better evidence of low intelligence than of emotional distress, and psychologically inclined criminologists tend to emphasize the importance of low intelligence (e.g., Gottfredson & Hirschi, 1990; National Research Council, 1993; Walsh, Beyer, & Petee, 1987; Wilson & Herrnstein, 1985). Clearly, such arguments are indirect and, moreover, highly ambiguous with regard to the direction of causality. That is, even if there is a significant link between low intelligence and antisocial behavior, does the antisocial or socially isolated stance cause poor thinking, or vice versa? Experimental tests (e.g., the present investigation) are necessary to answer that question.

How are these cognitive decrements mediated? On conceptual grounds, at least three major hypotheses could be put forward. The first involves an increase in arousal, stemming perhaps from nascent anxiety and uncertainty over the prospect of social exclusion. According to the standard effects of arousal, simple tasks would be facilitated, whereas complex ones would be impaired (Zajonc, 1965). Arousal would make people work faster, whereas accuracy might suffer. Some signs of heightened arousal would also presumably be evident.

The second possibility is that people might find the prospect of social exclusion threatening and respond by stifling their emotional reaction. This effort would preoccupy the self-regulation system, and previous work has suggested that one common set of self-regulatory resources is used for many different kinds of self-regulation as well as other controlled processes requiring the self's executive function (Baumeister, Bratslavsky, Muraven, & Tice, 1998; Muraven, Tice, Baumeister, 1998). If the self's resources were used in suppressing emotion, they would be less available for controlling cognitive processes. Hence, the more automatic cognitive processes would operate in a relatively unimpaired fashion, whereas controlled ones would suffer. This theory predicts little or no report of emotional distress.

The third possibility proposes that people ruminate about the social exclusion, and this preoccupation with their inner thoughts distracts them from processing incoming information. The reduced attention to subsequent tasks would impair performance on nearly all cognitive tasks or at least all that require attention.

In short, there are reasonable theoretical grounds for making quite different predictions about the potential impact of social exclusion on cognitive functioning. On an a priori basis, facilitation and impairment are both plausible, and emotional distress might or might not play a decisive mediating role. Impairment could be mediated by heightened arousal, by the commitment of the executive function to affect regulation, or by attentional load in connection with rumination.

Experiment 1

Our first experiment used a broad intelligence (IQ) test to investigate the possibility that social exclusion would alter cognitive functioning. We used the General Mental Abilities Test (Janda, 1996; Janda, Fulk, Janda, & Wallace, 1995), which was developed to provide a written, multiple-choice intelligence test suitable for administration to groups. It includes measures of verbal reasoning, mathematical ability, and spatial ability.

To manipulate social exclusion, we used a procedure developed by Twenge, Baumeister, et al. (2001). Participants were given a personality inventory and then provided with false feedback. In the crucial *future alone* condition, they were told that the results of the

test enabled the researchers to predict with high likelihood that the participants were the sort of people who would end up alone in life. Because this feedback was randomly assigned and would therefore be given to at least some people who presumably have rich networks of friends, several steps were taken to enhance credibility. First, each participant was given accurate feedback about his or her level of extraversion, on the basis of an accurate scoring of the trait scale. Second, the experimenter added that the participant may well have many friends and acquaintances at present, which is common among young people in university settings. The experimenter went on to say, however, that once the person is past the age at which people are constantly forming new friendships, the current friends will tend to drift apart and not be replaced, so that the individual will spend more and more time alone.

Two control groups were used. The first was the simple opposite of the future alone manipulation. These *future belonging* participants were told that the personality test feedback revealed that they were likely to spend the rest of their life surrounded by people who care about them. The social network was predicted to include a long, stable marriage and some lasting friendships.

The other control group was designed to provide unwelcome, aversive feedback that would not involve the dimension of belongingness. This *misfortune control condition* informed participants that later in life they would become increasingly accident prone. They would suffer broken bones and other mishaps requiring visits to hospital emergency rooms. If the effects of the future alone condition are due simply to receiving a bad, undesirable forecast about one's future, then the misfortune control group should yield similar effects. In contrast, if the misfortune control and future alone groups are substantially different, then one may infer with greater confidence that the effects of the future alone manipulation are specific to social exclusion.

Method

Participants. The participants were 40 undergraduates participating to fulfill a course requirement in introductory psychology. There were 19 men and 21 women, 70% White and 30% racial minority. Average age was 19.1 years.

Materials and procedure. The consent form said the study's purpose was to explore how personality relates to performance, but the experimenter did not verbally explain the purpose of the study. Participants first completed a personality questionnaire (the Eysenck Personality Questionnaire; Eysenck & Eysenck, 1975). They were then randomly assigned to hear one of three descriptions about their future life, ostensibly based on their responses to the personality inventory. To gain credibility, the experimenter first provided an accurate assessment of the subject's extraversion score, consisting of correct feedback about whether the score was high, medium, or low on this scale. The experimenter used this as a segue into reading a randomly assigned personality type description. One of three descriptions was read. In the future belonging condition, the participant was told, "You're the type who has rewarding relationships throughout life. You're likely to have a long and stable marriage and have friendships that will last into your later years. The odds are that you'll always have friends and people who care about you."

In contrast, people in the future alone condition were told,

> You're the type who will end up alone later in life. You may have friends and relationships now, but by your mid-20s most of these will have drifted away. You may even marry or have several marriages, but these are likely to be short-lived and not continue into your 30s. Relationships don't last, and when you're past the age where people are constantly forming new relationships, the odds are you'll end up being alone more and more.

Last, a misfortune control condition was included in which people were told,

> You're likely to be accident prone later in life—you might break an arm or a leg a few times, or maybe be injured in car accidents. Even if you haven't been accident prone before, these things will show up later in life, and the odds are you will have a lot of accidents.

This condition was intended to describe a negative outcome that was not connected to social exclusion.

After hearing the randomly assigned description, the participants filled out an item asking them to rate their current mood from 1 (*negative*) to 7 (*positive*). The experimenter then told them that they would have 6 min to complete as many items as they could on an intelligence test (the General Mental Abilities Test, described previously; Janda, 1996; Janda, Fulk, Janda, & Wallace, 1995). The experimenter collected the test after a timing bell recorded the end of the 6 min. The tests were then scored against a key (Janda, 1996) to determine the number of questions the participant got right. Number of questions wrong and number of attempts were also recorded.

After completing the test, participants were fully debriefed. They were told that the feedback about their extraversion score was true but that the further feedback was a randomly assigned description. Particular care was taken to ensure that participants in the future alone group understood that the prediction was random and not true for them. No participant was permitted to leave the laboratory until he or she expressed aloud that he or she understood that the manipulations were assigned at random and thus had no basis in fact. The experimenter also apologized for giving the false feedback and explained the rationale for the deception. Participants were also informed that the intelligence test was not really a good measurement of IQ under the conditions, because they had received the false feedback and were given only 6 min to work on a test that takes most people 20–30 min to complete.

Results

IQ test performance. Intelligent performance was apparently impaired by the diagnostic prediction of future social exclusion. As Table 1 shows, participants in the future alone condition answered significantly fewer questions correctly, as compared with participants in the future belonging and misfortune conditions, $F(2, 37) = 5.44$, $p < .01$. A post hoc Tukey's honestly significant difference (HSD) test showed that the future alone condition was significantly different from the other two conditions at $p < .05$. Thus, hearing that one was likely to be alone later in life affected

Table 1
Performance on the General Mental Abilities Test

	Future alone		Misfortune		Future belonging		
Variable	*M*	*SD*	*M*	*SD*	*M*	*SD*	*F*(2, 37)
No. right	18.92	7.39	24.77	4.49	25.79	5.10	5.44**
No. attempts	27.23	8.23	33.54	4.88	31.64	5.29	3.46*
No. wrong	8.46	4.03	8.85	4.30	5.86	3.68	2.25
Success rate (right/attempts)	0.69	0.14	0.74	0.10	0.82	0.11	4.29*

* $p < .05$. ** $p < .01$.

performance on a timed cognitive test. When the future alone and misfortune control groups were compared (the most rigorous test of the effect), the effect size for performance on the IQ test was $d = .98$, which is conventionally described as a large effect (i.e., anything higher than .80; Cohen, 1977). In other words, social exclusion feedback produced a substantial decrement in intelligent performance.

The decline in cognitive performance cannot be attributed to the simple fact of hearing any sort of bad news. Participants in the misfortune control condition, who heard that their future life would be disrupted by frequent accidents, scored as well on the IQ test as those in the future belonging group. Only the bad feedback that pertained specifically to social exclusion produced a significant drop in intelligence test scores.

There were no sex differences (main effects or interactions) for any of these analyses or those following. Thus, we do not discuss the issue further.

Attempts and accuracy. We recorded the number of test questions attempted by each participant, as a rough measure of effort. This analysis again showed significant variation among the three conditions, $F(2, 37) = 3.46$, $p < .05$. Participants in the future alone condition attempted the fewest problems. Again, the deficit was specific to feedback about social exclusion, insofar as participants in the misfortune control condition attempted as many problems (if not more) as did people in the future belonging condition (a post hoc Tukey's HSD test showed a $p < .05$ difference between the future alone and misfortune control groups).

Counting the number of errors yielded a different result, however. Participants in the misfortune control condition ($M = 8.85$; see Table 1) gave as many wrong answers as did those in the future alone condition ($M = 8.46$). In that sense, either kind of bad news seemed capable of causing people to make mistakes (compared with the lower number of errors made in the future belonging condition, $M = 5.86$; however, this difference was not significant). We also examined accuracy rates, which we computed by dividing each participant's number of correct responses by the number of problems the person attempted. An analysis of variance (ANOVA) on these scores again yielded significant variation among conditions, $F(2, 37) = 4.29$, $p < .03$. A post hoc Tukey test showed that the future alone and future belonging groups differed significantly at $p < .05$; the misfortune control group was not significantly different from the other two groups, lying somewhere in the middle.

How did misfortune control participants manage to earn good overall scores despite an elevated rate of mistakes? Their relatively high number of attempts provides the explanation. They attempted more problems than the future alone participants, which enabled them to get almost as many correct as did people in the future belonging condition while simultaneously getting as many wrong as people in the future alone condition.

These results are relevant to understanding the effects of social exclusion. The low scores achieved by participants in the future alone condition apparently resulted from two separate impairments. These participants made several more mistakes, and they also attempted fewer problems than did people in the other conditions (particularly the misfortune control condition). We said in the introduction that the heightened arousal explanation for impairments predicted an increase in speed and a decrease in accuracy. The misfortune control condition conformed to this pattern, but the future alone condition did not. Indeed, the significant reduction in speed among the future alone participants speaks strongly against the hypothesis that the effects of social exclusion were mediated by an increase in arousal.

Mood and emotion. We also wanted to assess whether mood was driving the effects. An ANOVA on the one-item measure revealed significant differences in mood among the three groups, $F(2, 37) = 4.32$, $p < .03$. The future alone ($M = 4.00$, $SD = 0.91$) and misfortune ($M = 4.23$, $SD = 0.93$) groups both reported neutral mood on the 1–7 scale, whereas the future belonging group reported a slightly more positive mood ($M = 4.93$, $SD = 0.73$). This pattern casts doubt on any hypothesis that mood is a mediating factor, because the misfortune control group resembled the future alone group in mood but resembled the future belonging group in IQ test scores.

Still, we conducted additional tests to investigate the possibility of mediation by mood. In these analyses, we compare the future alone condition with the misfortune control condition, as this represents the most stringent test of the mood mediation hypothesis. Consistent with the ANOVA reported earlier, we found a significant correlation, $r(24) = .45$, $p < .03$, indicating poorer performance by socially excluded individuals. Next, we computed the correlation between mood and IQ test performance and found that there was no relationship between mood and performance, $r(24) = .11$, *ns*.

If mood mediates the path between social exclusion and IQ test performance, then the correlation between exclusion (condition) and IQ test performance should become nonsignificant when controlled for mood (Baron & Kenny, 1986). However, this was not the case. When controlled for mood, social exclusion (condition) was still correlated with IQ test performance, $r(23) = .44$, $p < .03$. (Note that the partial correlation reduces the degrees of freedom by 1.) The mood mediation hypothesis also predicted that mood would be significantly correlated with IQ test performance even after exclusion (condition) was controlled. This was not the case; the partial correlation of mood and IQ test performance, controlled for exclusion, was not significant, $r(23) = .06$, *ns*. All of these results are contrary to the hypothesis of mediation by mood.

Discussion

Four conclusions were suggested by this first study. First, a diagnostic forecast of future social exclusion caused a significant drop in intelligent performance. Second, this was not due to participants merely hearing any bad forecast, because a prediction of being accident prone did not produce the same decrement. Third, the decline in performance reflected both a higher rate of errors and a reduced number of problems attempted (i.e., both speed and accuracy deteriorated). The loss of accuracy may be a result of participants hearing any sort of bad news, because it was also found in the misfortune control group, but the decline in speed (number of problems attempted) was unique to the socially excluded individuals. The decline in speed also contradicts the prediction based on heightened arousal as mediator of the effects of social exclusion. Fourth, bad mood did not mediate these effects.

Experiment 2

The second experiment was designed to investigate the effects of social exclusion on learning and memory. Experiment 1 shows

that social exclusion can impair subsequent performance on an intelligence test. In principle, this could be caused either by impaired processing of new information (encoding) or by impaired retrieval of stored information from memory. Experiment 2 seeks to tease these apart. To accomplish this, we varied the sequence of steps in the procedure. Obviously, the memory retrieval test has to be administered after the encoding task, by definition. But by altering the timing of the exclusion manipulation and the debriefing, we were able to ensure that only the encoding or only the retrieval task was performed while the participant was under the influence of the social exclusion manipulation.

More precisely, one condition (*recall affected*) permitted participants to encode the information first. Participants read passages from the Reading Comprehension portion of the Graduate Record Examination (GRE). After they finished reading, they received the manipulation of social exclusion, followed by the test for recall of the passages they had read, followed, finally, by debriefing. Thus, participants in that condition only performed the memory recall task while under the influence of the exclusion manipulation. In the other condition (*encoding affected*), the social exclusion manipulation was administered prior to the encoding (reading) of the passage. Then participants were debriefed to remove the effects of the social exclusion manipulation, and recall was tested afterward. In this condition, therefore, only the encoding was performed while the participant was under the influence of the social exclusion manipulation. This resulted in a 3×2 experimental design, with three exclusion manipulation conditions and two encoding versus recall affected conditions.

A second procedural change introduced in Experiment 2 was that we removed the time limit for the test. Experts disagree as to whether intelligent performance is best measured with timed or untimed tests, and in any case it was plausible that the strict time limit used in Experiment 1 could have had some differential effect on performers in the different conditions. (Observed differences in number of questions attempted lend credence to the notion that the time limit had a differential impact on performance scores.) To increase generality, therefore, we allowed participants in Experiment 2 as much time as they wanted to complete the recall test.

We also followed the GRE's own procedure of including both easy and difficult sections. The easy passage was simple and short, and the questions focused on recapitulating material from the passage. The difficult passage was longer and more complicated, and the questions required the person to be able to reason and think (as in understanding implications) about the material.

We predicted that social exclusion would lead to a general impairment of intelligent performance on all measures combined. The different mediating theories would make different predictions about the pattern of impairments. The arousal explanation would predict improved performance on the easy task and impaired performance on the difficult task. Furthermore, the effects of arousal should be most pronounced on retrieval, but arousal could affect encoding also if it leads participants to screen out some relevant information. The self-regulation of affect theory predicts that only the most controlled processes should show impairments, and these should mainly involve the difficult recall questions (which required some active thinking rather than just rote memory). Thus, the decrements should mainly be found on the recall (not encoding) task and in the high difficulty condition. Last, the rumination hypothesis predicts impairments on both the encoding and the retrieval tasks, because the inner process of rumination would take attention away from the job of encoding external information and would also distract the participant from figuring out what information needed to be retrieved to answer the memory questions. Both the easy and the difficult versions should show some decrements (though not necessarily to the same degree), because the inner distraction would prevent information from being encoded and processed.

Method

The participants were 65 undergraduates participating to fulfill a course requirement in introductory psychology. There were 41 men and 24 women, 72% White and 28% racial minority. Average age was 19.2 years.

The consent form told participants that they would complete a personality measure and perform some judgment tasks. The exclusion manipulation was identical to that used in Experiment 1: Participants completed the Eysenck Personality Questionnaire and were randomly assigned to hear that they would likely end up alone later in life (future alone), would suffer frequent accidents (misfortune), or would have many stable, fulfilling relationships throughout life (future belonging). They then completed a one-item mood measure, rating their mood from 1 (*negative*) to 7 (*positive*).

Participants were given 3 min to read two passages taken from the Verbal sections of a GRE. One passage was long and difficult, and the other passage was short and comparatively easy. Participants then answered 12 multiple-choice questions about the passages—7 about the difficult passage, and 5 about the easy passage. Half of these questions were taken from the actual GRE questions, and the other half were written for this experiment.

There was no time limit for answering these questions; participants were told they could take as long as they liked, and they were not timed. The number of correct answers on each passage served as the main dependent measure. Because all participants gave an answer to all questions on the untimed test, it was not possible to analyze number of attempts, and error rates were perfectly correlated with the number of correct answers.

We randomly assigned participants to one of two sequences of events. In the *recall affected condition*, participants read the passage (encoding), performed the short filler task of rating pictures of nature scenes, received the exclusion feedback (exclusion), answered the questions (recall), and were then told that the exclusion feedback was not true (debriefing). Thus, in the recall affected condition, participants encoded the information under normal conditions but retrieved the information under the influence of the exclusion feedback.

In the *encoding affected condition*, in contrast, participants received the exclusion feedback first (exclusion), read the passages (encoding), performed the filler task, were told the exclusion feedback was not true (debriefing), and then answered the questions (recall). Thus, in the encoding affected condition, participants encoded the information under conditions of exclusion but retrieved the information under the normal conditions, after having heard that the exclusion feedback was not true. The time elapsed between encoding and recall was about the same in both orders of presentation (administering the exclusion feedback took about as long as debriefing the participant). This created three future outcome conditions and two encoding versus recall conditions, resulting in a 3×2 design. We also examined difficulty of passage (easy vs. difficult) as a within-subject variable.

Results

Cognitive performance. We analyzed the data separately for the difficult as opposed to the easy questions, because the two tests involved different passages and different numbers of questions,

thereby rendering direct comparison of scores on the two sets of questions difficult to interpret. Performance on the difficult questions was analyzed with a 3 × 2 ANOVA. The interaction between sequence (i.e., encoding affected vs. recall affected) and exclusion feedback (future alone, future belonging, or misfortune control) was significant, $F(2, 59) = 3.21$, $p < .05$. Table 2 shows the means for this experiment. As inspection of Table 2 reveals, performance quality was quite similar in all cells except for one: Future alone participants in the recall affected condition performed significantly worse on the difficult task, as compared with participants in all other conditions. An ANOVA on the three cells in the recall affected condition revealed significant variation, $F(2, 33) = 4.91$, $p < .01$. For a comparison of the future alone and misfortune control conditions, the effect size for the difficult questions was $d = 1.01$, indicating a large difference in memory performance. No significant differences were found within the encoding affected condition. Thus, participants in the future alone condition showed deficits in the recall affected condition but not in the encoding affected condition.

Of particular interest was the difference between the recall affected and the encoding affected conditions. Performance level was essentially the same in these two procedures in the misfortune control condition. Likewise, future belonging participants performed about the same in both. But the future alone participants performed significantly worse in the recall affected condition than in the encoding affected condition, $t(19) = 3.18$, $p < .005$. Thus, recall of information was impaired by social exclusion, whereas encoding of information was not.

An ANOVA on the easy questions revealed no significant effects. In particular, future alone participants performed just as well as other participants on the easy questions—neither better nor worse. We did conduct a repeated measures ANOVA within the recall conditions, and it yielded a significant interaction between social feedback condition and difficulty of task, $F(2, 33) = 5.18$, $p < .02$. (Although direct comparison of answers to the easy versus the difficult task may seem inappropriate, there was no main effect for task difficulty, presumably because the greater number of difficult questions partly offset their greater difficulty, so that people got about the same number of easy and difficult questions correct.) This confirmed that the only notable performance decrement involved the future alone participants and the difficult questions. These results suggest that social exclusion impairs only the recall and use of complex information. This suggests a decrement in controlled processing and executive function.

Table 2
Performance of Graduate Record Examination Reading Comprehension Passages

	Easy passage			Difficult passage		
Condition	*M*	*SD*	*F*	*M*	*SD*	*F*
Recall condition[a]			1.54			4.91**
Future alone	4.25	1.42		2.75	1.60	
Misfortune	4.67	0.89		4.58	2.02	
Future belonging	3.83	1.11		4.75	1.54	
Encoding condition[b]			3.17†			0.10
Future alone	3.78	1.20		4.78	1.20	
Misfortune	4.70	0.48		4.60	2.17	
Future belonging	3.50	1.43		4.40	2.01	

Note. Scores indicate number correct; higher score indicates better performance. The easy passage contained five questions; the difficult passage contained seven questions.
[a] *df*s = 2, 33. [b] *df*s = 2, 26.
† $p = .06$. ** $p < .01$.

Mood. Again, we investigated the possibility that emotional responses mediated the cognitive impairments. Mood reports did not differ among the three social exclusion conditions, $F(2, 62) = 1.73$. The future alone ($M = 4.22$, $SD = 1.00$), misfortune ($M = 4.25$, $SD = 0.79$), and future belonging ($M = 4.64$, $SD = 0.66$) groups all reported moods near the neutral midpoint of the scale. Mood also did not differ when examined for the recall groups only, $F(2, 33) < 1.00$, *ns*, or for encoding groups only, $F(2, 26) = 2.13$, *ns*. A 2 × 3 ANOVA showed no main effects and no interactions for mood among the conditions.

Although the lack of significant differences in mood rendered a mediation of the cognitive impairments unlikely, we conducted a full mediation analysis for the recall groups' performance on the difficult passage. As in Experiment 1, we compared the future alone and misfortune control groups. The simple bivariate correlation between exclusion feedback (condition) and performance was $r(24) = .46$, $p < .03$. Controlled for mood, this correlation was unchanged, $r(23) = .46$, $p < .03$. Mood was not significantly correlated with performance, $r(24) = .05$, and this was unchanged when mood was controlled for exclusion (condition), $r(23) = -.04$. All of these results are directly contrary to the hypothesis of mediation by mood.

Discussion

The findings of Experiment 2 narrow the focus of the cognitive impairments caused by social exclusion. Feedback that forecast a lonely future led to significant and large impairments on a recall test that was difficult. There was no corresponding impairment of performance on an easy test. There was also no improvement on the easy task, contrary to the view that heightened arousal mediates the effects of social exclusion.

In contrast to the relatively poor recall, there was no sign of impaired encoding among the socially excluded. When people read the passage first and took the recall test under the influence of social exclusion, they performed poorly. In contrast, if they read the passage while under the influence of social exclusion—but were debriefed, which thereby removed the effects of social exclusion, before the recall test—they performed fine. In other words, people seemed quite capable of processing information into memory storage despite having received a message of social exclusion, but social exclusion impaired their ability to retrieve information from memory and use it to answer difficult, thought-provoking questions. This pattern of results seems less consistent with an explanation in terms of attention deficits (e.g., if the person were distracted by rumination) than with an explanation in terms of some deficit in executive function and, as a result, an impairment specific to controlled processes.

As in Experiment 1, there was no sign that mood effects mediated the cognitive impairments. Even the future alone participants did not report any substantial increase in emotional distress, and mood ratings were unrelated to cognitive performance.

Experiment 3

Experiment 3 was designed to help differentiate between two ways of interpreting the findings of Experiment 2. One way of interpreting the results is that social exclusion feedback impairs recall rather than encoding. The other line of interpretation is that it affects complex cognitive tasks that require active thinking, whereas simple and basic information processing remains unaffected. The ambiguity arose because the difficult questions on the reading comprehension test tended to require some reasoning rather than simple rote memory of information.

Experiment 3 therefore presented participants with one of two cognitive tasks. Half the participants were given questions from the Analytical section of the GRE. This test is explicitly designed to measure reasoning ability, so it seemed a good way to test for impairments of logic and reasoning without the confound of memory retrieval deficits. In contrast, the remaining participants were given a recall test involving nonsense syllables, which is a standard method used by cognitive psychologists to study memory without any confounding effects of reasoning or even meaningful thought.

If the main effect of social exclusion is on recall, then excluded participants should show deficits on the nonsense syllable task but not on the analytical reasoning task. In contrast, if the main impact is on logic and reasoning, then the decrements should be found on the analytical task and not on the nonsense syllable task. In terms of our mediation theories, the rumination and distraction theory predicts decrements on both tasks because of attentional load, whereas the executive function theory predicts that the decrements should mainly be found in the reasoning task. Reasoning requires the self to make an active effort to extrapolate from facts by drawing conclusions, considering alternatives, and distinguishing among possible implications.

An additional purpose of Experiment 3 is to try a different method of measuring emotion and mood. The first two experiments failed to find much in the way of emotional distress, but it is conceivable that the simple, one-item measure of emotion was somehow insensitive or unsuited to capture the emotional impact of the social feedback manipulation. Experiment 3 uses the Positive and Negative Affect Scale (PANAS; Watson, Clark, & Tellegen, 1988), which is a standard, respected, and frequently used measure of emotion.

Method

The participants were 82 undergraduates participating to fulfill a course requirement in introductory psychology. There were 48 men and 34 women, 71% White and 29% racial minority. Average age was 18.7 years.

The consent form said the study's purpose was to explore how personality relates to performance, but the experimenter did not verbally explain the purpose of the study. The exclusion feedback manipulation was identical to that used in Experiments 1 and 2: Participants completed the Eysenck Personality Questionnaire and were randomly assigned to hear that they would likely end up alone later in life (future alone), would suffer frequent accidents (misfortune), or would have fulfilling relationships (future belonging). They then completed the PANAS mood measure, which yields separate scores for positive mood and negative mood. In this sample, the positive mood scale had an internal reliability of $\alpha = .85$, and the negative mood scale had an internal reliability of $\alpha = .83$.

Participants were then assigned to one of two tasks: solving GRE Analytical section problems or memorizing and retrieving nonsense syllables. (Thus, this was a between-subjects, 3×2 design). Participants in the GRE Analytical section condition heard the social exclusion feedback, completed the PANAS, and were given 12 min to answer 12 analytical reasoning questions (5 questions on one logic problem, 3 reasoning questions, and 4 questions on another logic problem. These questions are rather long, and thus we do not reproduce examples here.) The dependent variable was the number of questions answered correctly. Number wrong, number of attempts, and success rate (number right divided by attempts) were also measured.

In the nonsense syllables task, participants were given 60 s to memorize a list of 15 nonsense syllables that varied in how easy they were to pronounce. All of the syllables consisted of three letters (e.g., *FUM, TYJ, KOY, WEV, JEF, PIH*). Participants then worked on math problems for 90 s as a filler. They then received the social exclusion feedback and completed the PANAS measure. They were then given 90 s to recall as many syllables as they could. The dependent variable was the number of syllables recalled correctly. Number wrong, number of attempts, and success rate (number right divided by attempts) were also measured.

Results

Cognitive performance. The results of this study suggest that social exclusion impairs reasoning but not simple recall. A one-way ANOVA on the Analytical GRE test scores revealed significant variation among the three conditions, $F(2, 44) = 5.43$, $p < .01$. As shown in Table 3, participants in the future alone condition answered significantly fewer of the GRE Analytical questions correctly. For a comparison of the future alone and misfortune control conditions, the effect size for this task was $d = 1.13$, indicating a large difference.

In contrast, an ANOVA on the nonsense syllable scores failed to find any differences between the conditions, $F(2, 32) = 0.39$, *ns*. As Table 3 shows, there was not even any slight trend toward inferior performance among the socially excluded participants. Clearly, their ability to recall the nonsense syllables was unimpaired. Nor can this be attributed to a ceiling effect due to the nonsense syllable task being too easy (comparable to the no-difference finding in the easy questions in Experiment 3), because, on average, participants could only correctly recall between 5 and 6 of the 15 stimulus syllables.

Table 3
Performance on Graduate Record Examination (GRE) Analytical Section and Nonsense Syllables Recall

Condition and variable	Future alone		Misfortune		Future belonging		
	M	*SD*	*M*	*SD*	*M*	*SD*	*F*
GRE Analytical[a]							
No. right	4.67	2.13	6.81	1.68	6.63	2.16	5.43**
No. attempts	6.94	2.05	10.31	2.09	8.51	2.34	9.46***
No. wrong	2.27	2.22	3.50	2.00	1.88	2.00	2.67††
Success rate (right/attempts)	0.69	0.27	0.68	0.17	0.80	0.20	1.45
Nonsense syllables[b]							
No. right	5.75	1.54	5.67	1.61	5.18	1.83	0.39
No. attempts	6.67	1.30	6.92	1.24	6.09	2.26	0.75
No. wrong	0.92	0.67	1.25	1.14	0.91	1.14	0.45
Success rate (right/attempts)	0.86	0.12	0.82	0.19	0.86	0.17	0.30

[a] *df*s = 2, 44. [b] *df*s = 2, 32.
†† $p = .08$. ** $p < .01$. *** $p < .001$.

To confirm the difference between the two tasks, we conducted a 3 × 2 ANOVA. The interaction between task and exclusion was significant, $F(2, 76) = 3.65$, $p < .05$. Because some might object that the number of nonsense syllables recalled was not directly comparable to the number of logic questions answered correctly, we standardized scores within task type and repeated the analysis. The result was nearly the same, with the interaction between task type and social feedback significant, $F(2, 76) = 3.20$, $p < .05$. Thus, future alone participants were hindered in their reasoning ability but not in their simple recall ability.

Attempts and accuracy rate. We conducted a series of additional analyses to investigate possible differences in accuracy rate, speed, and effort. The results of these one-way ANOVAs (within task type) are summarized in Table 3.

The only significant difference to emerge from these analyses involved the number of questions attempted on the Analytical test. Future alone participants attempted the fewest, whereas misfortune control participants attempted the most. This result was comparable to what we found in Experiment 1 (and, once again, it directly contradicts the view that increased arousal mediates the effects of social exclusion). There was a marginal trend toward more errors by the misfortune control participants. (If this is treated as a replication of Experiment 1, a one-tailed test is appropriate, and the difference was significant at $p < .05$.) The pattern of results for the success rate (which we computed by dividing the number right by the number attempted) was the same as in Experiment 1, but the result was not significant, possibly because of a floor effect created by the relatively small number of questions. In any case, it appears that misfortune control participants resembled and surpassed the future belonging participants in how hard they tried, but they resembled the future alone participants in their success rate.

On the nonsense syllable task, no differences were found on any of the measures. Given the nature of the task, it may be more difficult to measure attempts than on other tasks. In any case, these results are consistent with the view that social exclusion feedback has no effect on people's ability to store and remember information. This pattern is difficult to reconcile with the hypothesis that excluded people were actively ruminating about the message of exclusion and so were less able to attend to the information coming in from their environment.

Mood and emotion. The PANAS permitted a more detailed and thorough assessment of mood than was possible in Experiments 1 and 2. Across both task conditions, ANOVA on PANAS scores revealed significant variation in negative affect as a function of social feedback, $F(2, 79) = 3.33$, $p < .05$. Future alone participants reported the most negative mood ($M = 15.48$, $SD = 6.57$), followed by misfortune ($M = 14.07$, $SD = 3.50$) and future belonging ($M = 12.33$, $SD = 2.34$) participants. The difference between the future alone and future belonging group was $d = 0.71$, a moderate to large effect size. A 2 × 3 ANOVA showed no interaction and no main effect for task; the main effect for exclusion condition was significant, $F(2, 79) = 3.16$, $p < .05$. There were no differences in positive mood, $F(2, 79) = 0.65$. A 2 × 3 ANOVA showed no main effects and no interactions for positive mood. Thus, social exclusion increased negative mood but did not affect positive mood.

The possibility of mediation by mood was only relevant to participants who worked on the GRE Analytical task (because there were no differences in cognitive performance on the other, nonsense syllable task). Contrary to the mood mediation hypothesis, when we restricted the ANOVA to participants who performed the Analytical task, the analysis failed to show any significant variation in negative mood as a function of exclusion feedback, $F(2, 44) = 2.13$, *ns* ($M = 15.27$, $SD = 6.60$ for future alone; $M = 13.63$, $SD = 3.34$ for misfortune; and $M = 12.00$, $SD = 2.25$ for future belonging). There were also no differences in positive mood, $F(2, 44) = 0.84$, *ns*.

Although the mood differences among participants who performed the Analytical task failed to reach significance, we went ahead with a mediation analysis. Similar to the previous analyses, we examined the future alone and misfortune control conditions only. The simple bivariate correlation between social exclusion and performance on the GRE Analytical problems was $r(29) = .50$, $p < .004$. Controlled for negative mood, the correlation between exclusion and performance was $r(28) = .50$, $p < .005$. Controlled for positive mood, it was again unchanged from the bivariate, $r(28) = .48$, $p < .008$. The bivariate correlation between performance and negative mood was $r(29) = -.05$, *ns*. When controlled for condition, the correlation was $r(28) = .03$, *ns*. The bivariate correlation between performance and positive mood was $r(29) = -.32$, *ns*; after condition was controlled for, this was $r(28) = -.26$, *ns*. In short, these data satisfied none of the requirements for a conclusion that mood mediated between condition and performance.

To thoroughly investigate this issue, we also examined specific facets of negative mood as measured by the PANAS. As a main effect, there were no significant differences among conditions in anxiety (measured by the two items "jittery" and "nervous"), $F(2, 44) = 0.83$, *ns*. There were nearly significant differences in two fear items ("scared" and "afraid"), $F(2, 44) = 2.91$, $p = .06$, and significant differences in two general distress items ("upset" and "distressed"), $F(2, 44) = 5.91$, $p < .006$. However, none of these specific facets mediated the effect of exclusion on analytical problem performance. They did not correlate with performance when controlled for exclusion condition, and the correlation between exclusion and performance was not changed significantly when controlled for any of the facets.

Discussion

Experiment 3 sheds additional light on the nature of the cognitive impairments caused by social exclusion. The results indicate that a diagnostic forecast of future social exclusion can cause a significant reduction in logic and reasoning ability, but this forecast did not affect the ability to recall simple information. More precisely, people who were told they would end up alone in life performed worse than other participants on questions drawn from the GRE Analytical test. They were able to recall nonsense syllables just as effectively as people in other conditions, however. These findings point to an impairment in controlled processes rather than a broad attentional decrement, insofar as rejected people were fully able to encode and retrieve information as long as they did not have to engage in active reasoning. Put another way, the results are most consistent with the view that social exclusion leads to a deficit in controlled processes and executive function, possibly caused by the need to devote the self's regulatory resources to stifling emotional distress. They do not fit the view that recall in general is disrupted.

The effects were specific to social exclusion rather than being broadly the result of hearing bad news. Participants in the misfortune control condition, who were told that their future life would contain many painful accidents and injuries, got just as many items correct as did people who received the welcome feedback that their future life would be full of rich, satisfying relationships. The anticipation of future social isolation was thus more damaging than the forecast of future harm and misfortune.

The findings of Experiment 3 also echo those of Experiment 1 with regard to effort and accuracy. Participants in the misfortune control group were not totally unaffected by the forecast of future bad times, but they responded by increasing their efforts to do well on the task. They attempted more problems. The trend toward making more errors was also replicated (although it only reached significance by a one-tailed test). These participants' error rate was identical to that of the future alone participants and lower than that of the future belonging group, although the error rate differences failed to reach significance. Still, these results are broadly consistent with the view that the anticipation of social exclusion impairs performance in two ways, both by reducing effort and by increasing errors. Other kinds of bad news apparently only produce one of those, namely the increase in errors, which can be effectively offset by an increase in effort.

Experiment 3 used a more thorough and standard measure of emotion than Experiments 1 and 2 used. Despite the improved measurement, however, there was still no sign that mood mediated the cognitive impairments. In fact, the data satisfy none of the requirements for a mediation analysis. There is some indication that social exclusion produced a moderate increase in negative affect, but it failed to predict performance. Positive affect was unaffected by the exclusion manipulation.

General Discussion

The results of this investigation can be summarized as follows. In all three studies, people exhibited significant cognitive decrements after they were told that they were likely to end up alone in life. Thus, the prospect of social exclusion reduced people's capacity for intelligent thought. Moreover, the decrements in intelligent performance qualified as large effects every time.

The drop in intelligent performance appears to be specific to social exclusion. All three studies contained a control group that forecast future misfortune in the physical domain, such as accidents and injuries. Thus, there were two conditions (future alone and misfortune control) that conveyed bad news to participants. Moreover, in the one study that found significant differences in mood (Experiment 2), the misfortune control group yielded a mean mood that was closer to that of the future alone group than to that of the future belonging group. But these bad moods in the misfortune group were not accompanied by comparable decrements in cognitive performance. The misfortune control group consistently scored as high as the future belonging group on the measures of intelligent performance. Only the message of social exclusion led to significant reductions in cognitive performance.

The forecast of social exclusion caused people to attempt fewer problems as well as make more errors on those they did attempt. Speed and accuracy are not necessarily linked in that way, and, in fact, the traditional assumption and finding is that speed and accuracy are generally associated in the opposite manner, so that one improves at the other's expense, such as when performers trade off speed for accuracy. The simultaneous decline in both speed and accuracy is reminiscent of serious, wide-ranging cognitive impairments (e.g., from head injuries) rather than a strategic adjustment.

Not all cognitive functions were uniformly impaired by our manipulation of social exclusion. People who expected to end up alone showed the biggest decrements mainly in reasoning and thinking. Simple information processing seemed unaffected. Specifically, we found significant and large declines in performance on an intelligence test (Experiment 1), on challenging questions that involved recalling a complex passage and answering questions on the basis of that information (Experiment 2), and on a test of logic and reasoning (Experiment 3). In contrast, social exclusion produced no decrement in people's responses to relatively simple and straightforward questions about a simple reading passage (Experiment 2), nor on people's ability to perform a rote memory task involving goal-directed retrieval of nonsense syllables (Experiment 3). Experiment 2 also found that people who read a complex passage after receiving the social exclusion feedback were able to recall it without any noticeable decrement, provided that we had removed the message of social exclusion by debriefing them before they took the recall test. This shows that they were able to encode the information effectively into memory storage even though they had just received the message of social exclusion. After all, no matter how good one's memory is, one cannot recall something one has never learned.

These tasks differ in their reliance on executive function. Direct retrieval of information is generally regarded as an automatic process, at least once the goal of retrieving the information has been activated (Logan, 1989). Thus, simply recalling exactly what one has been told does not invoke executive function. On both the nonsense syllables task and the easy recall task, direct retrieval was all that was required, and rejected people performed fine. In contrast, automaticity is undermined on tasks that require effort and control (Bargh, 1994; Kahneman, 1973), such as engaging in logical reasoning or extrapolating from information in memory, and on these tasks, the socially excluded people showed significant impairments.

The fact that socially excluded people performed well on many tests helps rule out some alternative interpretations. For example, some might suggest that the social exclusion feedback made participants angry at the experimenter or reduced their willingness to complete the tasks in the experiment. (To be sure, such a reaction might have been expected to yield clearer evidence of antipathy on the mood measures, and at least negative moods would have been more strongly correlated with cognitive performance than we found, so these interpretations are inconsistent with some findings.) But it is hard to imagine that these supposedly disgruntled participants would have encoded the information in the complex reading passage so effectively or matched the high achieving groups on the nonsense syllable task. Likewise, the debriefing in Experiment 2 involved telling participants that the experimenter had deceived them, and if they were already disgruntled, that would have likely made them even more so. They should therefore have performed especially poorly on the recall test that came after the debriefing. Instead, we found that they performed especially well. In a similar vein, if social exclusion feedback conveyed some implicit experimenter demand characteristic that induced partici-

pants to cooperate with the experimenter by performing poorly, then this feedback should have yielded more uniform decrements in performance, including on the nonsense syllables task, but it did not. In short, it does not appear that the results can easily be explained on the basis of demand characteristics or disgruntled participants.

We had three theories about how social exclusion might impair cognitive performance. The theory based on heightened arousal was contradicted by multiple findings. Arousal should have produced an increase in speed of performance, but, instead, the socially excluded people showed a decrease in speed in both studies in which we measured it (Experiments 1 and 3; Experiment 2 used untimed tests). Also, arousal should have facilitated performance on the simple tasks, but there was no sign of that either. Last, the reports failed to show much sign of emotional distress, and, indeed, socially excluded participants tended to report neutral moods. The slight increases in distress in Experiment 3 did not mediate performance. Hence, we reject the arousal explanation.

Another possible explanation involves attention deficits caused by ruminating about the message of exclusion. Several findings appear inconsistent with this explanation. Socially excluded people were quite capable of encoding and recalling nonsense syllables (Experiment 3) and of encoding meaningful information into memory (Experiment 2). If their attention had been reduced by inner distractions, they would have shown decrements in their intake of new information, but they did not. Hence, the attention deficit explanation also seems unlikely.

Instead, the results seem most consistent with the view that social exclusion specifically impairs controlled processes, such as by monopolizing some of the resources of the self's executive function. Impairments were found on tasks that required active thinking, such as reasoning and logic, whereas the relatively automatic (less efficient, less controlled) tasks were unaffected. Recent work has suggested that the self's executive function uses a common resource for diverse acts of volition and self-regulation, including controlling feelings, controlling thoughts, resisting temptation, making choices, and responding actively instead of passively (Baumeister et al., 1998; Muraven et al., 1998). Although we have no direct evidence that socially excluded participants were engaged in self-regulation, the surprising lack of emotion they reported in response to what must have come as upsetting news is at least consistent with the view that they suppressed their negative feelings. In Experiment 1, for example, the mean affective state in the future exclusion condition was precisely on the neutral point of the scale, despite the fact that participants had been told that much of their future was likely to be spent all alone in the world. This effort at affect regulation (if that is indeed what it was) would have used up some of the self's executive resources, rendering it difficult to think and reason actively but allowing the simpler and more automatic cognitive processes to proceed.

In sum, we think we can best explain the pattern of cognitive decrements by proposing that social exclusion constitutes a threatening, aversive event but that people strive to suppress their emotional distress, and the resulting drain on their executive function impairs their controlled processes. Although this explanation fits what we found, it is desirable for future research to provide some direct evidence that people respond to social exclusion with an active effort to suppress emotion. We recognize the methodological difficulty of obtaining such evidence, however.

The view that social exclusion leads to a breakdown in self-regulation can potentially explain far more than the present results. In other studies, we have found that socially excluded people behave in more aggressive ways (Twenge, Baumeister, Tice, & Stucke, 2001), whereas prosocial behavior is reduced (Twenge, Ciarocco, & Baumeister, 2001). It is crucial that these studies likewise failed to find much in the way of strong emotional distress or mediation by mood, even though they included studies that manipulated direct, current social rejection rather than the mere forecast of future exclusion like the present three studies. The aggression and prosocial behavior findings had a paradoxical aspect, because one might think that social exclusion should motivate people to try harder to gain acceptance, such as by reducing aggression and increasing helpful, generous, and cooperative behavior, whereas the opposite appears to be more correct. Yet a breakdown in self-regulation would potentially explain both patterns of findings, insofar as prosocial behavior often requires one to put the collective ahead of self-interest, and aggressive impulses are often held back by inner restraints.

One important limitation is that the present studies investigate how social exclusion affects intelligent thought about matters having nothing to do with social belongingness per se. Other work has found that social exclusion can have specific and positive effects on cognitive processes pertaining to belongingness and the self (e.g., Gardner, Pickett, & Brewer, 2000; Leary, 1990; Leary, Tambor, Terdal, & Downs, 1995; Williams, 1997; Williams & Sommer, 1997).

Another limitation of the present work is that the future social relationships were generally presented in a positive light. The choice was essentially between being embedded in a network of satisfying, positive relationships or being alone. We did not include a control group in which people expected a future that would involve being firmly embedded in a network of conflict-filled, hostile, or antagonistic relationships. Such a prediction might be difficult to make plausible in cultures such as that of the United States, in which most people can leave and replace aversive or abusive relationships, but it might be particularly relevant to other cultures in which people are locked into firm social groups regardless of personal preference. There is some evidence that the need to belong is not satisfied by hostile, conflictual, or antagonistic relationships (see Baumeister & Leary, 1995). For example, Vinokur and van Ryn (1993) found that the benefits of social support were limited to positive, pleasant interactions, and, indeed, social relationships characterized by conflict, criticism, and undermining were harmful to mental health. Because our theorizing began with the need to belong, we assumed that aversive relationships would be similar to if not worse than being alone, but the data from the present experiments did not test this.

We began by suggesting that human survival in the evolutionary past could be facilitated either by intelligent problem solving or by affiliation with a social group—and that it seemed adaptive for the failure of one strategy to result in a facilitation of the other. This line of reasoning predicts that people who failed to secure membership in social groups should respond with an increase in the capacity for intelligent thought.

Our three studies consistently show the opposite effect, however. Substantial decrements in intelligent thought were repeatedly

found among people who received messages of social exclusion. Rather than compensating for each other, intelligent thought and social inclusion seem to have a positive, direct relationship, if anything. Our results are more consistent with the view that intelligence evolved as a means to support and facilitate social relations rather than to compensate for the absence of their advantages (although our data fall far short of permitting such a sweeping conclusion). Our findings could even be taken to suggest that people responded as if being excluded from social groups removed the need for intelligent thought. Although some may regard social cognition as a small aspect or special case of human thought, the present results offer at least a hint that cognition in general may have an important social basis.

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Received June 7, 2001
Revision received March 18, 2002
Accepted April 1, 2002 ■

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