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BEING OPEN MINDED WITHOUT KNOWING WHY: EVIDENCE FROM NONCONSCIOUS GOAL PURSUIT

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Goal pursuit is a process that takes us from a certain state in the present towards a desired state in the future. Goal pursuits, then, are likely to require adaptation to changing circumstances and environments. The current paper reviews recent advances in the study of nonconscious goal pursuit. It argues that given the importance of adaptation, nonconscious goal pursuit ought to be much more flexible than previously thought. Two mechanisms that allow such flexibility are implicit learning and executive processes, and evidence for their involvement in nonconscious goal pursuit is reviewed. Two new studies that examine how nonconscious goal pursuit increases and decreases open mindedness, a form of flexibility, are described.

Every parent to a young child must know how it feels when he tries to walk home from the car (or brush his teeth, or do shopping, or cook), yet the child simply won't let him. First there is this smashed snail on the floor that the child must pick up and closely examine, then the climbable fence that simply has to be climbed, the neighbor's dog, the neighbor himself, the autumn leafs and . . . and the list seems simply endless. In moments like this you often realize how goal directed is your behavior: You want to get home not in an hour, not in half an hour, and not even in ten minutes. The fact that your goal is not shared by your child—who introduces obstacle after an obstacle—makes the goal loom larger in consciousness: HOME. NOW. This fine-tuned awareness is less likely to occur on a childless day in which you quietly lock your car and silently stroll home. In other words, under the latter, more "normal" circumstances, goal pursuit is likely to be largely nonconscious.

This paper reviews recent developments in the study of the mechanisms that underlie nonconscious goal pursuit, and it presents two new studies that examine them. We begin by describing the prevalent views, which hold that nonconscious goal pursuit is based on spreading of activation in pre-established networks of mental associations. We then argue that while using these networks may often be advantageous, it is also costly: They tie us to past experiences, and hence stand in

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the way of quick adaptation to novel circumstances. Given the severe limitations of conscious resources this constraint may sometimes be severe, we argue. We then propose that nonconscious goal pursuit may go beyond existing associations by recruiting resources and using adaptive mechanisms such as implicit learning and working memory. We describe recent research that examined these hypotheses, and present new data for the flexibility of nonconscious goal pursuit.

NONCONSCIOUS GOAL PURSUIT: A PRIMER

Nonconscious goal pursuit appears to be a good solution for an organism that has many goals, yet very limited capacity for conscious processes. And indeed, the last decade provided ample support for the idea that goals and motivations can operate outside of conscious awareness. From Bargh's automotive model (Bargh, 1990; Bargh, Gollwitzer, Lee-Chai, Barndollar, & Troetschel, 2001; Bargh et al., 2008, this issue), through Kruglanski's goal system approach (Kruglanski, 1996; Kruglanski et al., 2002) to Berridge's "wanting" (Berridge & Winkielman, 2003; Berridge & Aldridge, 2008, this issue), research in the cognitive sciences converges on the idea that goal-directed processes can occur outside of conscious awareness.

So how are goals pursued implicitly? Current theories of nonconscious goal pursuit are associationistic in nature: Goals, contexts in which we usually pursue them, and means we frequently use for their achievement, are assumed to form networks of mental representations. Within each network, activation of any one component (e.g., a specific context) may lead to the activation of other components (e.g., goals and means), thus resulting in goal pursuit (Bargh, 1990; Kruglanski et al., 2002).

To take an example, if every day, at 3:30 pm, you end your working day and go to pick up your child from daycare, it is likely that the hour (3:30) will be associated in your mind with the goal (of picking your child) and with related means. Hence, the mere activation of "3:30"—whether you are home, on a vacation in southern France, or at a conference far away from home—may lead to thoughts and behaviors that are related to this goal. Similarly, if your child is associated in your mind with the goal of going home and nurturing, the mere presentation of your child's name at work should result in decreased commitment to your current goals, thus freeing you from your present obligations. More concretely, if you are a subject in an experiment, the subliminal presentation of your child's name should decrease your attempts to attain the goal of doing well in the experiment. And indeed, it does (Hassin, 2005a).

Associative networks have many advantages, one of which is that they are based on one's history. This characteristic allows humans to bring past experience into future goal pursuits, thus increasing the likelihood of quick goal achievement (and, hopefully, decreasing the likelihood of making fatal mistakes). Sadly, though, we do not only gain from past experience, we may also be constrained by it. If due to changing circumstances the lessons learned in one's past are no longer valid for one's future behavior, then history-bound networks are likely to lead to dead ends (figuratively and literally). More specifically, if changes in one's environment entail changes in the goals themselves, or in the effectiveness of means, then existing goal networks have to be transcended.

NONCONSCIOUS GOAL PURSUIT IN NOVEL ENVIRONMENTS

So how does one go beyond past experience in goal pursuit? The modal, dual-process view suggests that in order to do so one has to *consciously attend* to the environment and to *consciously learn* its intricacies. Once one familiarizes herself with the new environment, one stands in a good position to adopt a new mean.

Alas, the combination of two well-known factors casts doubt on the efficiency of this solution. First, human beings usually pursue multiple goals at any given moment, and the environments in which we pursue these goals are dynamic. Second, it is by now well known that our capacity for conscious processes is very low (Kahneman, 1973). It seems reasonable to conclude, then, that conscious processes cannot tell the whole story of how we adapt our goal pursuits to novel environments and changing circumstances.

It is quite fortunate, then, that humans are equipped with more than conscious learning: Past research in the cognitive sciences teaches us that we can implicitly learn very complex structures in our environment, thus saving our precious conscious resources for other processes (e.g., Nissen & Bullemer, 1987; Reber, 1967). Consider, for example, one of the most widely used implicit learning tasks, the serial reaction task (SRT; Nissen & Bullemer, 1987). In each trial in this task participants are shown a stimulus that appears in one of four possible locations on the screen, and they are instructed to indicate its location by pressing one of four keys on the keyboard. In the training blocks the sequence of locations in which the stimuli appear is fixed (e.g., if "1" indicates the leftmost location and "4" the rightmost, the sequence may be 1324323432). Upon finishing the training blocks participants are usually unaware of having learned any sequence, or of the sequences themselves. Yet, their behavior indicates that the sequences had been learned: They are faster on sequence (vs. random location) blocks.

In the context of the current discussion, then, the interesting question is whether nonconscious goal pursuit can recruit, or enhance, implicit learning. Recent research in our laboratory suggests that this is indeed the case. Participants in these studies had been first primed (or not) with achievement goal, and they then engaged in various implicit learning tasks. The results were unequivocal: Nonconscious goal pursuit resulted in improved implicit learning. Thus, for example, in the SRT task described above, the RT differences between sequence and nonsequence trials was larger for primed participants (Eitam, Hassin, & Schul, 2008).

Our results, then, show that nonconscious goal pursuit can improve adaptation by enhancing implicit learning. But implicit learning has a number of drawbacks, the most salient of which (in the current context) is that it usually requires numerous exposures to the environment. In other words, it requires *time* and *experience*. On many occasions these requirements are easy to meet. To take a trivial example: If during renovations of one's house one moved an electricity switch from one location to another, getting used to the new location may take a while. But this is hardly a problem: We have a second chance, and a third, and a fourth, almost ad infinitum.

Getting a second chance or, more generally, taking time to acquire experience, cannot always be taken for granted, though: Just think of first dates, job interviews, exams, dangerous circumstances, new bosses, and difficult times in one's mar-

riage. More generally, on many occasions adaptation to changes has to be made on the fly, right here and now, or else goal achievement is endangered.

NONCONSCIOUS GOAL PURSUIT, RESOURCES, AND EXECUTIVE FUNCTIONS

It is with these cases in mind that my colleagues and I suggested that nonconscious goal pursuit would benefit from encompassing mechanisms that allow us to quickly go beyond existing, history-bound networks. We suggested, then, that nonconscious goal pursuit may recruit resources that improve the operation of mechanisms such as working memory (WM) or, more generally, executive processes.[1] Why WM? We discuss this issue in more detail elsewhere (Aarts, Hassin, Custers, & Eitam, 2007; Hassin, 2005b; Hassin, Aarts, Eitam, Custers, & Kleiman, in press; Hassin, Eitam, Aarts, & Custers, 2007). Succinctly put, WM allows for active maintenance of ordered information for relatively short periods of time. Executive functions (that are inherent in WM models) can then use this information to create new representations and to plan, coordinate and execute behavior, especially in those cases that call for nonhabitual procedures. The literature assumes that working memory is central for goal pursuit, and evidence from neuropsychology corroborates: Damage to brain tissues associated with working memory results in decreased capacity for successful goal pursuit (Aarts et al., 2007; Baddeley, Della Salla, Papagno, & Spinnler, 1997; Damasio, 1994; Luria, 1966; Norman & Shallice, 1986; Shallice, 1982).

To demonstrate the involvement of WM in nonconscious goal pursuit my colleagues and I employed two related strategies. First, we examined whether performance on tasks that are usually conceived of as WM tasks can be affected by goal priming. Second, we used span tasks to examine whether nonconscious goal pursuit can increase and decrease WM's executive capacity.

Thus, my colleagues and I (Hassin, 2005b; Hassin, Bargh, & Zimerman, in press) used priming procedures to activate achievement goals, and we then examined participants' performance on the Wisconsin Card Sorting Test (WCST; Berg, 1948). In the WCST participants are asked to sort cards to one of four decks, and they receive feedback after each sorting. An underlying rule determines what counts as a correct sorting. Participants take a while to learn this rule, but after a while they succeed. The crucial feature of this test is that after ten correct sortings the rule changes. Crucially, participants are not explicitly notified in any way about the rule change or about the nature of the new rule: They simply begin to receive negative feedback, and they have to adapt their behavior (i.e., discover the new rule and use it). This goes on until two decks of cards are sorted.

As the description above makes evident, the WCST is a complicated task that taps various cognitive abilities. Still, it is one of the most widely used tests of exec-

1. There are a number of models of WM, and the investigation of executive functions is even broader, hence a thorough discussion of these notions is well beyond the scope of the current paper. We focus on the notion of working memory because the Baddeley & Hitch (1974) model includes both executive functions and rehearsal mechanisms, both of which seem important for goal pursuit. However, since our knowledge of WM's Executive is very much in the making (Baddeley, 1996), we use "WM" and "executive functions" interchangeably.

utive functions used to examine neuropsychological populations, especially those with frontal damage. In addition, previous research has shown that it taps at least one aspect of executive functioning—shifting (Miyake, Friedman, Emerson, Witzki, & Howerter, 2000).

The results of two experiments clearly showed that goal priming affected participants' performance on the WCST: Primed participants could more easily shift between cognitive sets, and were thus better than nonprimed participants. Importantly, the former were unaware of having been primed, and were unaware of the influences of the priming task on their WCST performance. Furthermore, their explicit goal commitment was similar to that of control participants. In other words, although the behavioral measures show that the primed group had more achievement motivation than the nonprimed group, these differences were not reflected in participants' explicit ratings. We conclude, then, that priming resulted in goal pursuit that is unintentional and nonconscious (for similar logic see Aarts, Gollwitzer, & Hassin, 2004; Bargh et al., 2001).

To further investigate the interaction between nonconscious goal pursuit, allocation of resources, and executive processes my colleagues and I used a variety of span and inhibition tasks (for an overview see Hassin, Aarts et al., in press). These included the operation span (Turner & Engle, 1989), the automated versions of the operation and reading spans (Unsworth, Heitz, Schrock, & Engle, 2005), and an inhibition of prepotent response paradigm developed by Jonides and his colleagues (Jonides, Smith, Marshuetz, Koeppe, & Reuter-Lorenz, 1998). In all of these studies participants were primed prior to engaging in the executive task. In some of the studies participants were primed with an applicable goal (e.g., achievement). In others, they were primed with inapplicable goals, that is—goals that cannot be achieved through the task (e.g., going out, having fun). The results of these experiments clearly showed that applicable goal priming resulted in an increased span and improved inhibition. Inapplicable goal priming, however, led to reduced span and poorer inhibition (Aarts et al., 2007). Like in the previous set of studies, primed participants' explicit goal commitment was similar to that of control participants, and they were unaware of having been primed.

We interpreted these findings as evidence for implicit resource allocation to primed goals. Since goals were always primed prior to the introduction of the executive task, they were always allocated resources first, thus leaving fewer resources to the task itself. When the goals could have been pursued through the task (applicable goal priming), the resources that were allocated to these goals were used for the task. These resources came on top of the resources that participants consciously allocated to the task, and hence WM span and inhibition capacity went up (as compared to control participants). When primed goals could not have been pursued through the task (inapplicable goal priming) the resources that were allocated to them were not used for the task, and hence performance went down.

IMPLICATIONS OF WM'S INVOLVEMENT IN NONCONSCIOUS GOAL PURSUIT

The lines of research that we reviewed thus far provide support for the idea that WM, and executive functions more generally, are involved in nonconscious goal

pursuit. There are two implications of these lines of work that I would like to briefly discuss before turning to the present inquiry of nonconscious flexibility in attributions.

Cognition-Motivation Interaction. The idea that nonconsciously pursued goals may be allocated resources and may recruit executive functions suggests a possible interface between implicit motivation and cognition, one that may help in narrowing the (more general) gap between cognition and motivation.[2] Specifically, the idea of implicit recruitment of resources (for a critical discussion of the notion of "resources" see Navon, 1984) may provide a bridge between "cold" mental representations and the "cold" cognitive processes in which they take part, and the "warm" motivating forces that drive our behavior. Under this suggestion, inert representations of goals, and mental computations defined over these representations (aka, cognitive processes), sometimes acquire access to the control of behavior and cognition by virtue of their intimate relationship with mental resources and executive functions.

The Flexibility of the Unconscious. The view endorsed here suggests that executive processes play an important role not only in conscious, effortful processes, but also in nonconscious, phenomenologically effortless ones. One of the implications of this view is that nonconscious goal pursuit may reveal adaptivity and flexibility that were hitherto mainly attributed to conscious, effortful processes.[3]

THE CURRENT INVESTIGATION

Our previous work examined the flexibility associated with nonconscious goal pursuit by measuring performance on the WCST and other tasks in which flexibility is manifested in adaptation to changes. The current studies extend the investigation of the flexibility of nonconscious goal pursuit by examining a different aspect of flexibility, one that has to do with being open-minded and receptive to various alternatives and perspectives. Under this use of "flexibility," one is more flexible the more she realizes that the world is not "black and white," that others' points of view may be as valid as one's own, that a behavior may have many causes, and so on.

We examine this aspect of flexibility via causal attributions, a set of complex cognitive processes that has a long history in Social Psychology (e.g., Gilbert, Pelham, & Krull, 1988; Jones & Davis, 1965; Kelley, 1967; Trope, 1986). Importantly, these processes are not only complex, they are generally considered to involve controlled, effortful components (Gilbert et al., 1988; Trope, 1986). The current studies, then, examine whether goal priming can increase our engagement in these effortful processes, thereby allowing us to entertain multiple causes for a given behavior. Furthermore, while all of our previous studies on the subject examined

2. It is interesting to note that the notion of resource originated from motivation research. Only later on it acquired the "cold" cognitive meaning and operationalization.

3. Naturally, flexibility and adaptivity per se are not limited to conscious processes, and are revealed by many blatantly non-conscious biological mechanisms such as the immune system. Yet, in the realm of high level mental processes—cognitive, affective or motivational—the commonplace assumption is that flexibility is indeed mainly confined to conscious, effortful processes (see Hassin, 2005b).

how nonconscious goal pursuit enhances flexibility, one of the present studies examines whether nonconscious goal pursuit can reduce flexibility.

STUDY 1

In the first stage of the study participants were primed (or not) with the goal of being flexible, and they then engaged in an attribution task in which they were asked to consider various causes for a protagonist's behavior. If flexibility can be nonconsciously pursued, then primed participants should reveal more open-mindedness than participants in the control group.

METHOD

Research Participants

Thirty-eight students of the Hebrew University (23 females and 15 males) participated in the study either for course credit or for 10 NIS (~$2).

Materials and Tools

We constructed two scenarios in which the cause for a protagonist's salient behavior was ambiguous. Participants were asked to read these scenarios, and they were then asked about various possible causes of the behavior. In one of the scenarios, for example, the protagonist—a senior secretary to a CEO—suddenly leaves a conference room where an important meeting takes place. Embedded in the scenario are causal cues. To take a few examples, the text subtly suggests that the secretary might have been romantically involved with one of the colleagues in the meeting; that it is getting too late for her; that her boy is waiting in the other room, and so on. Participants were asked to evaluate, on a 9-point scale, "how likely is it that the secretary left the room because of X," where X stands for a possible cause for her behavior (e.g., "how likely is it that the secretary left the room because her boy was waiting in the other room"). Each scenario was accompanied by eight questions.

In the absence of unequivocal information, open-minded people should be more willing than rigid people to seriously entertain various causes for a given behavior. This task, then, taps the second type of flexibility discussed above—flexibility as open-mindedness.

Goal Priming

Pilot Study. This study examined the strength of the association between 74 words and the concept of flexibility. Twenty six participants were asked to assess the "degree to which various words are associated with flexibility." The seven words that received the highest scores were chosen for the study. These were Flexible, Elastic, Rubber, Change, (to) Adapt, Stretched, and (to become) Accustomed.[4] All scores were larger than 7.9 on a 9 point scale.

Priming. The priming manipulation was carried out in what was allegedly "a first experiment," in which participants were asked to complete a word-search

puzzle. In each of the two forms of the puzzle, a 10 × 10 matrix of letters was presented, below which appeared a list of 13 words that were embedded in the matrix. Each list contained the same set of six neutral words to be found (building, turtle, green, staple, lamp, plant), with the remaining seven words relevant (or not) to the concept of flexibility (cf., Bargh et al., 2001).

Procedure

Participants were told that their main task is relatively short, and were asked whether they minded helping the researcher with a pilot for another study. All of them agreed, and the experimenter gave them the word-search task. After having finished the word-search task participants were thanked and asked to get ready to move to the "actual experiment" that "assessed text comprehension." This was, in actuality, the open-mindedness task described above.

Primed participants are hypothesized to be more open-minded, and hence to be more willing to endorse multiple causes. In other words, the average causal ratings of the primed group should be higher than that of the control group.

RESULTS

Assessing Awareness

Upon completion of the attribution task participants were thoroughly debriefed in order to assess their awareness to the nature of the tasks and the purpose of the study. Participants were asked explicit, specific questions that tapped awareness and conscious control. These included (a) "what do you think was the purpose of the word-search"; (b) "were there any common themes in the words of the word-search"; (c) "do you think that the word-search affected your performance in the second experiment in any way? Please specify"; (d) "do you think that your performance in the second experiment would have been different had you taken it in a separate session" and (e) "what was the goal of the second experiment?" Only two participants suspected that the two studies were related, and their data were excluded from the analyses.

Awareness of goal pursuit was further determined by explicit ratings of goal commitment. Participants were asked "how important was it for you to be open-minded and flexible in this task?" This question was accompanied by a 9-point scale that ranged from "not at all" to "very important." The results showed no significant difference between the two groups, $t < 1.3$.

Open Mindedness

Participants' mean rating was computed separately per each scenario. Then, these two means were entered into a repeated measures ANOVA, with Scenario as a within subject factor and Priming as a between subject factor. As hypothesized, participants who were primed with flexibility were more open minded ($M = 4.85$, $SD = .82$) than participants in the control condition ($M = 4.31$, $SD = .65$), F (1, 34)

4. In Hebrew, all of these are single-word expressions.

= 5.03, $p < .04$. There was also an unexpected effect of Scenario but, importantly, there was no interaction between the two factors, $F < 1.3$.

These findings show that primed participants more strongly endorsed multiple causes for the protagonist's behavior. In other words, they were more open minded than participants in a control group.

STUDY 2

Goal pursuit should increase flexibility when the latter is either a goal, or a mean for goal achievement. When flexibility stands in the way, however, goal pursuit should reduce it. The current study attempts to empirically establish the latter case by manipulating regulatory focus.

According to Higgins' regulatory focus theory (e.g., Higgins, 1997, 2005) people in prevention focus are primarily concerned with safety and security. In other words, induction of prevention focus results in increased accessibility of safety goals. When people strive to feel safe they seek, among other things, to reduce uncertainty. One way of doing this is by simplifying our picture of the world. Simplified pictures allow easier predictions of the future that may result in improved control, or stronger feelings of control. Both of these factors may enhance the phenomenology of safety.

To examine whether nonconscious goal pursuit may result in reduced flexibility we conceptually replicated and extended an earlier study on prevention focus conducted by Nira Liberman and her colleagues (Liberman, Molden, Idson, & Higgins, 2001). Like in the first study described above we used the "separate experiments" paradigm. In the "first experiment" a prevention focus was either induced or not. In a second, allegedly unrelated experiment, we administered the flexibility-as-open-mindedness task that was introduced in Study 1.

Recall that during this task participants are confronted with causal uncertainty: It is unclear which one of the antecedents (or what mixture of them) caused the behavior of the protagonist. To reduce causal uncertainty participants need to figure out the causal structure, thereby distinguishing between plausible and implausible causes. On the one hand, then, they may more strongly endorse those causes that they deem plausible. Alternatively, they may more strongly discount those causes that they deem implausible. Each of these processes by itself, and their combination particularly, will result in a simpler, more polarized, "black and white" picture of the world, thus reducing uncertainty. This reduced uncertainty comes with a price of being less open minded, less flexible.

One comment is in order before we continue. In the first study we showed that the pursuit of flexibility resulted in an increase in the average endorsement of causes. Intuitively, then, one may expect that reduced flexibility would result in the opposite effect, that is—in decreased average endorsement of causes. But there is more than one way of being inflexible, and there are good reasons why a general decrease in endorsement of causes should not occur in the current study. Simply, this strategy does not allow for an improved discrimination between the various causes (they all become less plausible), and is then unlikely to reduce causal uncertainty. Participants who seek to reduce causal uncertainty, then, should not endorse this strategy. They should adopt the strategy described above, which al-

lows them to better discriminate between various causes, thereby reducing causal uncertainty.

METHOD

Research Participants

Forty-eight students of the Hebrew University participated in this study (30 females, 18 males) for either credit or 10 NIS (~$2).

Materials and Tools

To prime safety goals the current study used a procedure previously used by Higgins and colleagues to induce prevention focus (Higgins, Roney, Crowe, & Hymes, 1994; Liberman et al., 2001). Participants in the experimental condition were asked to describe their current duties and to compare them to their duties ten years ago. Control participants were asked to describe their current neighborhood and to compare it to the one they lived in ten years ago.

Procedure

Participants were told that they would take part in two separate studies. They were first asked to do the priming task, which they completed at their own pace. Upon finishing they were handed the flexibility as open-mindedness task (see Study 1).

RESULTS

Assessing Awareness

In a thorough debriefing three participants suggested that the two tasks were related, and their data were excluded from the analyses. The debriefing of another participant suggested that the manipulation was not successful and her data were excluded from the analyses too.

In an attempt to probe participants' awareness they were asked "what was the purpose of the first [priming] task." None of them guessed the nature of the task, nor its purpose. To assess awareness of their (in)flexibility goal participants were additionally asked to indicate "how important was it for you to be flexible and open-minded in the second task." The scale ranged from 1 ("not at all") to 9 ("very much"). The results show that there were no significant differences between the two groups on this goal commitment measure, $t < 1$.

To sum up, participants were not aware of having been primed, of the nature of the priming, and of any relations between the priming stage and the flexibility as open mindedness task. Furthermore, the two groups did not differ in terms of their awareness of pursuing the goal of being (in)flexible.

Automatic Inflexibility

According to our predictions, participants who nonconsciously pursue safety goals may advance towards them by more strongly discounting some causes and/or more strongly endorsing others. This strategy results in a simpler, more "black and white," view of the situation, and it should be evidenced in the use of the extreme ends of the scales. To test the use of the endpoints we counted, per each participant, the number of causes she or he evaluated as very unlikely (1 or 2 on the scale; Low likelihood) and very likely (8 or 9; High likelihood). These two numbers were then entered into a repeated measure ANOVA, with Likelihood (Low vs. High) as a within subject factor and Priming (Safety vs. Control) as a between subject factor.

The results show a significant main effect of priming, such that primed participants used both ends of the scale more than control participants (M = 2.20 and SD = 1.07, M = 1.52 and SD = .91, respectively), F (1, 42) = 4.34, $p < .05$. While this effect was not qualified by an interaction ($p > .4$) it was more prominent at the lower end of the scale (Ms = .90 and 1.38, t (42) = 1.79, $p = .08$) than at the upper end of it (Ms = .62 and .82, t (42) = 1.07, $p = .29$).

Another way to look at the effect is to examine within-subject variance. We computed, per each participant, the within-subject variance between her or his evaluations of the different causes, and we used this measure as our dependent variable. The results corroborate the previous analyses: Primed participants showed more variance in their judgments than control participants (M = 2.57 and SD = .57, M = 2.11 and SD = .39, respectively), F (1, 42) = 9.15, $p < .01$.

One alternative explanation of the current results is that prevention focus led participants to choose more prevention-related causes. In other words, if prevention focus led participants to choose specific prevention-related cause(s), then the documented reduction in open mindedness is simply a byproduct of congruency, or fit, between regulatory focus and specific causal explanation(s). If this is indeed the case, then we should be able to see an effect on specific causes that are prevention/promotion in nature. To rule out this possible explanation we examined the effect of the manipulation on individual causes. Only one cause out of eighteen (5.5%) was significantly affected by our manipulation, and it was not obviously related to prevention or promotion foci.

To sum up, then, primed participants accepted more causes as very likely, and at the same time categorized more causes as very unlikely. These results imply that they developed a simpler, more "black and white" picture of the world. Participants' primed need for safety, then, resulted in decreased open-mindedness.

DISCUSSION

The results of Study 2 support our contention that when flexibility stands in the way of goal achievement—automatically pursued goals may result in reduced flexibility. Specifically, participants who implicitly pursued safety goals were inclined to construe a simpler view of the world. To this end they became less open-minded—they focused more strongly on a subset of plausible causes, while more strongly discounting the rest. These results, then, complement those of Study 1 by showing that nonconscious goal pursuit may enhance or reduce flexibility as a function of what best serves one's currently pursued goal.

GENERAL DISCUSSION

The environments within which we live our lives are complicated and dynamic. Goal pursuit, a sophisticated process whose purpose is to take us from a certain state in the present to a desired state in the *future*, has to accommodate these dynamic environments. To do so, it needs to be able to go beyond our past experience, to cope with obstacles we never dealt with, and to make changes and adaptations on the fly.

Given the infamous scarcity of mental resources (Kahneman, 1973) nonconscious goal pursuit is unlikely to be an infrequent, negligible factor in our lives. We argued, then, that nonconscious goal pursuit is likely to encompass mechanisms that allow us to go beyond our goal-specific learning history. One such mechanism is implicit learning—the ability to learn complex patterns outside of conscious awareness. Indeed, recent evidence from our laboratory shows that nonconscious goal pursuit can enhance implicit learning. Other mechanisms that may serve similar functions are executive processes, and working memory more specifically. Again, recent evidence from our laboratory shows that nonconscious goal pursuit may lead to the recruitment of resources that may then improve WM and executive processes (Hassin, Aarts, Eitam, & Custers, 2006; Hassin, Aarts et al., in press).

In this paper we reported two new tests of the idea that nonconscious goal pursuit may increase and decrease cognitive flexibility. Using a novel attribution paradigm we showed that the goal of being flexible increases flexibility-as-open-mindedness, whereas prevention motivation, which has been found to activate safety goals, reduces attributional open-mindedness. These studies extend previous findings by providing fresh evidence for the striking malleability of nonconscious goal pursuit (Hassin, Bargh et al., in press)

Lastly, we wish to succinctly discuss two speculative ideas that seem consistent with our findings and argumentation. First, we argued that nonconscious goal pursuit influences, or moderates, working memory and executive processes. Given the nature of nonconscious goal pursuit, it seems plausible to suggest that it recruits relatively *implicit working memory*, or a *nonconscious executive*. The idea of implicit WM (whether as a mode of operation, or as a separate mechanism) is undoubtedly foreign to the current zeitgeist in the cognitive sciences (e.g., Baars & Franklin, 2003; Baddeley, 1993; Cowan, 1999; Dudai, 2004; Gathercole, 2007; Kintsch, Healy, Hegarety, Pennington, & Salthouse, 1999; O'Reilly, Braver, & Cohen, 1999). Our data, however, are not the only data that are consistent with it. First, evidence for visual and nonvisual short term memories has been mounting since the mid 1990s (e.g., Maljkovic, 1995; Maljkovic & Martini, 2005; McKone, 1995, 1998). Secondly, Naccache and colleagues (Naccache et al., 2005) recently examined a patient who showed intact executive processes but lacked the phenomenological quality of effortfullness. In other words, this patient showed "effortless control." Thirdly, David Amodio and his colleagues have recently documented ERN and N2—two components that are associated with cognitive control—in trials in which race bias and cognitive control appeared to be nondeliberative (Amodio et al., 2004).

Secondly, the manipulation in Study 2 was by no way direct. In other words, we did not directly prime a goal. Instead, "duties" were primed, and this activated a prevention orientation, that strategically reduces flexibility/openness in the service of vigilance and uncertainty reduction. This hypothesized process may

suggest, then, that the results of the current studies—and maybe others in the literature—may be better understood in terms of an activation of strategic plans and strategic motives, that then go on to control cognition and behavior (e.g., via goal activation; Higgins, 2005). This hypothesized mechanism seems to fit nicely with recent evidence in the goal priming literature, as well as that in the ideology-priming literature (e.g., Ferguson & Hassin, 2007; Hassin, Aarts et al., in press; Hassin, Ferguson, Shidlovsky, & Friedenberg, 2007).

While both of these speculative ideas are, well, just that: speculative ideas, they may open the way for an intriguing journey into the nature, and interdependence, of motivation, cognition, and executive functions.

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