



Power of the desired self: Influence of induced perceptions of the self on reasoning

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ABSTRACT

This research shows that the motivation to possess a desired characteristic (or to avoid an undesired one) results in self-perceptions that guide people's use of base rate in the Lawyer–Engineer problem (Kahneman & Tversky, 1973). In four studies, participants induced to believe (or recall, Exp. 2) that a rational cognitive style is success-conducive (or an intuitive cognitive style failure-conducive) subsequently viewed themselves as more rational and relied more on base rate in their probability estimates than those induced to believe that a rational cognitive style is failure-conducive (or an intuitive cognitive style success-conducive). These findings show that the desired self had an influence on reasoning in the self-unrelated lawyer–engineer task, since the use of base rates was mediated by changes in participants' perceptions of their own rationality. These findings therefore show that the desired self, through the working self-concept that it entails, constitutes another factor influencing people's use of distinct modes of reasoning.

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1. Introduction

People are motivated to see themselves in a self-serving manner (e.g., Dunning, 1999; Markus & Kunda, 1986; Pyszczynski & Greenberg, 1987; Taylor & Brown, 1988). For instance, Kunda and colleagues induced their participants (university students) to believe that either extraversion or introversion was related to academic and professional success. In the subsequent self-perception task, participants who were led to believe that extraversion is conducive to success rated themselves as more extraverted and less introverted than participants provided with the opposing beliefs (Kunda, 1987; Kunda & Sanitioso, 1989; Sanitioso, Kunda, & Fong, 1990).

These rather short-lived and transient changes in people's self-perception are known in the literature as the working self-concept (Markus & Nurius, 1986; Markus & Ruvolo, 1989; but see also, e.g., Conway & Pleydell-Pearce, 2000, for a slightly different use of this term). This working self-concept is achieved and maintained by the temporary accessibility of instances of self-knowledge that confirm the desired self-perception (Brunot & Sanitioso, 2004; Markus & Kunda, 1986; Sanitioso & Niedenthal, 2006; see also e.g., Sanitioso, Conway, & Brunot, 2006 for a review). Throughout our lives, we accumulate many instances of knowledge about ourselves (i.e., a self-concept; see e.g., Markus, 1977) and much of this accumulated self-knowledge is clearly contradictory. For example, many people will have had the experience of being charming and funny at friends' parties and grumpy and dry at family gatherings. What part of these different (and often contradictory) instances is most accessible at any given time (i.e., working self-concept) depends on the self-relevant objectives that are currently active (Conway & Pleydell-Pearce, 2000;

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Markus & Kunda, 1986; Markus & Nurius, 1986; Markus & Ruvalo, 1989). As such, the working self-concept enables people to perceive themselves in terms of characteristics that allow them to come across as an ideal dating partner, a desirable job applicant etc., in short as *the right person in the right place*. This paper examines possible consequences of this well-established social psychological phenomenon on reasoning.

Past research has shown that the working self-concept influences processing of different kinds of self-relevant information (e.g., Brunot & Sanitioso, 2004; Sanitioso, 1998, 2008; Sanitioso & Niedenthal, 2006; Sanitioso et al., 1990; see also Sanitioso et al., 2006; Smeesters, Wheeler, & Kay, 2010, for reviews). For instance, after a belief induction using the same procedure as Kunda and colleagues described above, Sanitioso and Wlodarski (2004) gave their participants false feedback about their extraversion and introversion. In a surprise recall task, extraversion-success participants remembered extraversion feedback more accurately and introversion feedback less so relative to introversion-success participants.

Extending this research we wished to investigate whether such motivated changes in self-perception may have a broader influence on people's information processing (i.e., not limited only to the processing of information that is self-relevant in terms of its content). More specifically, this paper examines the extent to which manipulating the desirability of individual characteristics corresponding to either rationality or intuition (Epstein, Pacini, & Heier, 1996) not only leads to changes in temporary self-perception in terms of those same characteristics (as past research suggests) but also impacts reasoning in the self-unrelated Lawyer-Engineer problem (hereafter referred to as the L-E problem; Kahneman & Tversky, 1973).

The L-E problem was specifically devised to illustrate that people tend to experience difficulties in using sample-based (e.g., consensus or base rate) information in their judgments of particular situations or people (e.g., McArthur, 1972; Tversky & Kahneman, 1974). In one of its original formulations, it reads as follows¹:

Several psychologists interviewed a group of people. The group included 30% (70%) of lawyers and 70% (30%) of engineers. The psychologists prepared a brief summary of their impression of each interviewee. The following description was drawn randomly from the set of descriptions:

Dan is 45 years old. He is married and has four children. He is generally conservative, cautious, and ambitious. He shows no interest in political and social issues and spends most of his free time on his many hobbies, which include home carpentry, sailing and mathematical puzzles.

When asked to estimate the chances out of 100 that Dan is an engineer, people often disregard normative criteria (i.e., base rates) and rely instead on stereotypical or super-

ficial similarities between their personal beliefs about the portrayed person and prototypes of the categories available for selection (i.e., representativeness heuristic). As a result, the estimated probability that “a man having no interest in political issues and spending most of his free time on his hobbies, including mathematical puzzles” is an engineer is consistently high, independent of whether the proportion of engineers in the sample is stereotypically congruent (i.e., 70%) or incongruent (i.e., 30%) with the description.

Four experiments reported below examined the idea that people's pervasive tendency to rely on representativeness can be reduced by their rational working self-concept. Given that people align their self-perceptions with characteristics that are conducive to personal success (e.g., Kunda & Sanitioso, 1989; Sanitioso et al., 1990), participants in the following experiments were led to believe that individuals with rational (vs. intuitive) cognitive style experience more (vs. less) success (vs. failure) in their academic studies and later lives (i.e., an outcome that is highly self-relevant to the university freshmen in our samples). We hypothesized that the participants who viewed rationality as conducive to personal success (and intuition as conducive to personal failure) would see themselves as more rational than those for whom the opposite beliefs were induced. More importantly, we also hypothesized that, after manipulating rational versus intuitive working self-concepts, these perceptions they now have of themselves would also influence whether participants relied more on base rate vs. representativeness in the L-E problem.

This hypothesis is rooted in the dual-process framework, which postulates the existence of two distinct systems of reasoning (e.g., Barbey & Sloman, 2007; Epstein, 1990, 1994; Evans & Over, 1996; Kahneman & Frederick, 2002, 2005; Sloman, 1996a; Stanovich & West, 2000).² According to this perspective, the use of representativeness is the product of an *intuitive* system (i.e., rapid, automatic, effortless), whereas the use of base rates is the product of a *rational*³ system (i.e., slow, controlled, requiring effort [see e.g., De Neys, 2006a, 2006b for a detailed description and discussion of these systems]). We hypothesized that the working self-concept activated by individuals' desired self-perceptions in a given context would also guide which system participants would most rely on in a subsequent reasoning task.

Specifically, we predicted that believing an intuitive cognitive style is success-conducive (or alternatively that a rational cognitive style is failure-conducive) entails an intuitive working self-concept favoring the use of a system that draws inferences “by using such aspects of general knowledge as images and stereotypes” (Sloman, 1996a, p. 4). Thus, these individuals would be more likely to rely on representativeness in their judgments. In contrast, believing that a rational cognitive style is success-

¹ In Kahneman and Tversky's (1974), participants were presented with five written vignettes.

² But see, e.g., Erb et al. (2003), Keren and Schul (2009), and Kruglanski and Gigerenzer (2011) for arguments against the dual-processes framework.

³ See Inbar, Cone, and Gilovich (2010) for a distinction between rational and intuitive systems.

conductive (or intuitive cognitive style failure-conductive) entails a rational working self-concept that favors the use of a rational system that reasons by logical rules. As a result, we hypothesized that such individuals would be more likely to use base rates in their judgments. Critically, we predicted that reliance on rational reasoning is specifically due to a stronger perception of a rational self and a weaker perception of an intuitive self (as confirmed by statistical mediation), such that the more people's temporary self-perceptions shift towards rationality, the greater their subsequent preference for using a rational system (over an intuitive system) during reasoning.

2. Experiment 1

2.1. Method

2.1.1. Participants and design

Ninety-four psychology undergraduates at Clermont University volunteered to participate in the study. They were randomly assigned to one of the experimental conditions in a 2 (induced cognitive style: rational vs. intuitive) \times 2 (predicted outcome: success vs. failure) \times 2 (problem type: congruent vs. incongruent) between-subjects design.

2.1.2. Materials and procedure

All phases of the experiment were conducted in the laboratory using paper and pencil. Participants first read excerpts from an (ostensible) scientific report:

"In an extensive longitudinal study, an interdisciplinary research group [...] wished to examine the predictors of academic and professional success among psychology students. [...] Using a large array of tests and scales, researchers performed a comprehensive assessment of each participating individual, while also tracking their academic and professional achievements throughout the ten years that followed his/her enrollment in the psychology program.

The most novel findings of this study relate to individuals' general disposition (also called cognitive style) towards either rationality or intuition. More specifically, it showed that psychology students with a rational (vs. intuitive) cognitive style (i.e., one characterized by a high reliance on reason and facts [vs. instincts and feelings] in their everyday judgments and decisions) achieve more (vs. less) academic and professional success. Indeed, they tend to have higher (vs. lower) grades and thus are more (vs. less) likely to be accepted into graduate programs than students characterized by a highly intuitive (vs. rational) style. A rational (vs. intuitive) cognitive style also constitutes an advantage (vs. disadvantage) in their early professional careers: they are more (vs. less) highly regarded by their superiors and tend to have more (vs. less) stable and rewarding professional careers.

These findings are unrelated to the participants' other characteristics (such as IQ for instance)".⁵

The participants were then asked to explain (on the basis of their own experience and knowledge)⁶ why these findings might be true (see e.g., Kunda and Sanitioso (1989) for similar experimental inductions).

At this point, the experimenter noted that there was still some time left and asked the participants whether they would be willing to participate in another short study (conducted by another experimenter). They all agreed and were presented with the L-E problem in one of its textual forms (Kahneman & Tversky, 1973)⁷ in which the base rates (BRs) were either congruent (i.e., 70% of lawyers) or incongruent (i.e., 30%) with the provided description.

The participants were thanked and told they could leave after they had completed the task. At this point, the experimenter "realized that he had forgotten to administer another questionnaire relating to the first study". All the participants then rated the extent to which they personally considered intuitive and rational cognitive styles to be predictive of academic and professional success on 7-point Likert-type scales (0 = *not at all*; 6 = *very much*).

After they had completed this last questionnaire, the participants were thanked again and fully debriefed. None of the participants detected or suspected any relationship between the two parts of the experimental protocol.

2.2. Results

2.2.1. Control of experimental inductions

Participants' ratings of the extent to which rational and intuitive cognitive styles (hereafter, RCS and respectively ICS) predict academic and professional success were subjected to a mixed ANOVA with cognitive style (rational vs. intuitive) and predicted outcome (success vs. failure) as two between-subject factors. This manipulation check yielded the expected three-way interaction between cognitive style, outcome, and rated cognitive style, $F(1, 91) = 74.60, p < .001, \eta_p^2 = 0.45$. Thus our inductions indeed succeeded in modifying participants' beliefs (see Table 1).

2.2.2. Base rate sensitivity

Participants' probability estimates were analyzed in a 2 (induced cognitive style: rational vs. intuitive) \times 2 (predicted outcome: success vs. failure) \times 2 (problem type: congruent vs. incongruent) between-subjects ANOVA. This analysis revealed both a main effect of base rates, $F(1, 88) = 15.76, p < .001, \eta_p^2 = .14$, and a two-way Cognitive

⁵ The words (in French) used to portray the Rational Cognitive Style (RCS) such as rationality, reason, facts, etc. were selected on the basis of Epstein et al. (1996). Their (French) antonyms (i.e., intuition, instincts, and feelings) – generated for the most part by a sample of 30 undergraduates – were used to portray the Intuitive Cognitive Style (ICS).

⁶ Since, as expected, in none of the reported experiments, the averages number of statements generated were affected by our experimental inductions, we do not report these non-essential analyses.

⁷ The participants' task was to estimate the probability (out of 100) that a person (Jean) randomly drawn from a sample [composed of 70 (vs. 30) lawyers and 30 (vs. 70) engineers] was a lawyer. A description of Jean's distinctive individuating characteristics included characteristics that are stereotypically associated with lawyers.

⁴ In order to keep the presentation concise, we have removed some non-essential details.

Table 1

Mean ratings of the extent to which rationality and intuition respectively were predictive of success as a function of induced cognitive style and predicted outcome.

		Rational cognitive style				Intuitive cognitive style			
		Success	Failure	<i>F</i>	η_p^2	Success	Failure	<i>F</i>	η_p^2
Experiment 1	Rationality	4.08 (1.10)	2.75 (1.33)	16.35**	.15	1.74 (1.10)	4.00 (1.02)	45.99**	.35
	Intuition	2.08 (1.32)	3.87 (1.33)	21.35**	.19	3.74 (1.45)	2.33 (1.24)	23.21*	.12
Experiment 2	Rationality	3.75 (.58)	2.38 (.96)	24.44**	.29	2.19 (0.91)	3.44 (0.63)	20.20**	.25
	Intuition	1.81 (.83)	3.50 (1.03)	32.26**	.35	3.56 (.51)	2.00 (.89)	27.66**	.32
Experiment 3	Rationality	5.09 (1.00)	2.26 (1.03)	114.41**	.48	2.47 (1.05)	4.38 (1.13)	52.54**	.30
	Intuition	1.53 (1.11)	4.03 (.98)	77.39**	.39	4.09 (1.35)	1.81 (1.03)	65.43**	.35

Note. Standard deviations are given in parentheses. Presented *F*s, correspond to the main effect of outcome for each cognitive style.

* $p < .01$.

** $p < .001$.

Table 2

Mean estimates (out of 100) as a function of induced cognitive style, predicted outcome and problem type.

		Rational cognitive style		Intuitive cognitive style	
		Success	Failure	Success	Failure
Experiment 1	70%	69.17 (15.10)	71.83 (19.53)	75.00 (22.36)	65.00 (10.87)
	30%	35.83 (9.00)	68.33 (20.82)	70.83 (15.64)	49.25 (20.33)
	<i>F</i>	21.75**	0.24	0.34	4.85*
	η_p^2	.20	–	–	.05
Experiment 2	70%	67.50 (10.00)	80.00 (15.92)	76.88 (16.62)	70.00 (16.33)
	30%	37.50 (11.83)	69.38 (27.92)	69.38 (23.80)	47.50 (26.20)
	<i>F</i>	46.72**	5.86*	2.92	26.28**
	η_p^2	.44	.09	–	.31
Experiment 3	70%	73.13 (12.50)	68.13 (25.36)	78.13 (12.52)	78.13 (12.23)
	30%	38.75 (12.04)	78.67 (12.46)	69.38 (27.92)	44.38 (21.28)
	<i>F</i>	26.63**	2.46	1.73	18.63**
	η_p^2	.19	–	–	.15

Note: 70% corresponds to congruent, and 30% to incongruent problems. Standard deviations are given in parentheses. Presented *F*s, correspond to the main effect of the type of problem at each level of the predicted outcome for each induced cognitive style.

* $p < .05$.

** $p < .001$.

Style \times Predicted Outcome interaction, $F(1,88) = 21.80$, $p < .001$, $\eta_p^2 = .20$. These effects are qualified by the predicted three-way interaction between the three aforementioned factors, $F(1,88) = 8.39$, $p < .01$, $\eta_p^2 = .09$, which was decomposed by testing the simple main effects of problem type at each level of predicted outcome for each induced cognitive style (see Table 2).

Table 2 shows that the probability estimates produced by the RCS participants were not reliably affected by the base rate information (i.e., 30% vs. 70% of lawyers) in the RCS-failure condition. In contrast, the probability estimates were affected in the RCS-success condition and the obtained estimates were close to the given base rates. Thus, in line with our hypotheses, RSC-success participants were base rate sensitive, while those in the RSC-failure condition disregarded the base rates. Mirroring the above results and in line with our hypotheses, ICS participants' estimates were reliably affected by the presented base rates in the ICS-failure condition, whereas ICS-success participants disregarded these base rates.

2.3. Discussion

Our findings are consistent with the idea that people's desire to see themselves as characterized by attributes

conducive to success plays a role in their base rate sensitivity. Nevertheless, since we did not measure people's actual self-perceptions, this remains tentative. Thus the next study addresses this issue while replicating the first study with a different experimental procedure.

3. Experiment 2

3.1. Method

3.1.1. Participants and design

Sixty-four undergraduates at ESC Clermont business school volunteered to participate in the study. They were randomly assigned to a 2 (induced cognitive style: rational vs. intuitive) \times 2 (predicted outcome: success vs. failure) \times 2 (problem type: congruent vs. incongruent) mixed-factorial design. The latter factor was manipulated at a within-subjects level and the order of the two problems counterbalanced.

3.1.2. Materials and procedure

The experiment was conducted as a part of an Organizational Behavior class examining Personality and Values (based on Robbins and Judge (2009)). The experiment

consisted of three sections (i.e., experimental induction concerning rationality vs. intuition, self-perception measure, and L–E problem solving). All were paper-and-pencil-based and the sections were separated by a considerable amount of time.

The induction of self-perceptions in terms of rationality vs. intuition took place within the framework of classroom activities related to the Myers–Briggs Type Indicator (MBTI), which was also briefly discussed in abovementioned textbook. A booklet given to each participant stated that the thinking vs. feeling dimension of the MBTI can predict quite successfully decision-making in the business environment. Participants were then invited to perform a self-assessment on this thinking vs. feeling dimension, which was referred to as their cognitive style. To this end, they were asked to recall experiences from their own lives in which reliance on reason and facts as opposed to instincts and feelings (vs. reliance on instincts and feelings as opposed to reason and facts) had led them to good (vs. poor) decisions. The participants also answered some unrelated, bogus questions that were inserted to make the self-assessment exercise credible.

The following part of the experiment assessed participants' self-perceptions in terms of rationality and intuition (Kunda, 1987; Kunda & Sanitioso, 1989) following the cognitive style manipulation described above. Presented as a class activity involving personality assessment in organizations, it required participants to rate themselves on 25 traits (listed in alphabetical order), including three rationality-related (*rationnel* [rational], *logique* [logical], *réfléchi* [reflective]) and three intuition-related (*intuitif* [intuitive], *spontané* [spontaneous], *instinctif* [instinctive]) traits. Participants responded using 5-point Likert-type scales (0 = *not at all*; 4 = *very much*).

The last part of the experiment was presented as a classroom activity on problem solving. The participants were given two L–E problems. In one problem the base rates were incongruent with the provided description, in the other they were congruent.⁸ The order of these problems was counterbalanced (i.e., congruent problem first vs. incongruent problem first) within-subjects.

Finally, once they had rated the extent to which they personally considered the two cognitive styles to be predictive of success on 5-point Likert-type scales (0 = *not at all*; 4 = *very much*), the participants were thanked, fully debriefed and asked for permission to use their class activity answers as experimental data. None of the participants detected or suspected any relationship between the different parts of the experiment.

3.2. Results

3.2.1. Control of experimental inductions

Again, our experimental inductions were successful. As in Experiment 1, participants' ratings of the extent to

⁸ The first problem was the same as in Experiment 1. In the second problem, the participants' task was to estimate the probability (out of 100) that a person (François) randomly drawn from the same sample [composed of 70 (vs. 30) lawyers and 30 (vs. 70) engineers] was an engineer. A description of François' distinctive individuating characteristics included characteristics that are stereotypically associated with engineers.

which rational and intuitive styles (RCS and ICS) were function of the expected three-way interaction between induced cognitive style, predicted outcome, and rated cognitive style, $F(1,60) = 132.81$, $p < .001$, $\eta_p^2 = 0.69$ (see Table 1).

More importantly, participants' self-perceptions in terms of rationality and intuition⁹ changed in line with these inductions as the three-way interaction between induced cognitive style, predicted outcome, and type of dimension, $F(1,60) = 86.04$, $p < .001$, $\eta_p^2 = 0.59$ indicates (see Table 3).

As expected, RCS-success participants rated themselves significantly higher on rationality and significantly lower on intuition than did RCS-failure participants, whereas ICS-success (compared to ICS-failure) participants rated themselves significantly lower on rationality and significantly higher on intuition. Thus, the manipulation was successful in making participants shift their self-perceptions (i.e., working self-concept) toward the success-conducive (or failure-avoidant) induced cognitive style.

3.2.2. Base rate sensitivity

Participants' probability estimates (generated for one congruent and one incongruent problem) were subjected to a mixed ANOVA with induced cognitive style (rational vs. intuitive), predicted outcome (success vs. failure) and order of individuating descriptions (incongruent vs. congruent problem first) as between-subject factors. As this analysis revealed that the problem-presentation order did not influence participants' probability estimates, these are presented in Table 2 collapsed over the two presentation orders. The analysis also revealed a main effect of Problem Type, $F(1,56) = 60.56$, $p < .001$, $\eta_p^2 = .52$, and a two-way Cognitive Style \times Predicted Outcome interaction, $F(1,56) = 16.28$, $p < .001$, $\eta_p^2 = .23$. These effects were qualified by the predicted Cognitive Style \times Predicted Outcome \times Problem Type interaction, $F(1,56) = 14.60$, $p < .001$, $\eta_p^2 = .21$. The pattern of these results is thus qualitatively the same as that obtained in Experiment 1 (see Table 2).

3.2.3. The role of self-perceptions in base rate sensitivity

We hypothesized that the differences in the use of base rates were due to temporary changes in participants' self-perceptions (i.e., their working self-concept). This means that the use of base rates should be due to a stronger perception of a rational self and a weaker perception of an intuitive self, such that the more people's temporary self-perceptions shift towards rationality, the greater is their use of base rates during reasoning. In other words, the effect of Cognitive Style \times Predicted Outcome interaction on participants' probability estimate should be statistically mediated by self-perceived rationality.

To test these predictions, we conducted a mediated moderation analysis (Muller, Judd, & Yzerbyt, 2005). We first computed for each participant a Rationality Index (RI, i.e., the difference between the mean score on traits

⁹ Since both Cronbach alphas were greater than .70 (in all reported experiments), we computed separate means for rationality and intuition.

Table 3

Mean self-perception ratings of rationality and intuition as a function of induced cognitive style and predicted outcome.

		Rational cognitive style				Intuitive cognitive style			
		Success	Failure	<i>F</i>	η_p^2	Success	Failure	<i>F</i>	η_p^2
Experiment 2	Rationality	3.65 (.33)	2.88 (.62)	19.46**	.25	2.71 (.60)	3.23 (.36)	8.89*	.13
	Intuition	2.71 (.40)	3.44 (.29)	27.82**	.32	3.69 (.54)	2.73 (.29)	48.05**	.45
Experiment 3	Rationality	4.44 (.76)	2.56 (.75)	87.24**	.41	2.81 (.84)	4.20 (.84)	48.20**	.28
	Intuition	2.21 (.75)	4.09 (.56)	99.84**	.45	3.78 (.81)	2.27 (.83)	65.65**	.34

Note. Standard deviations are given in parentheses. Presented *F*s correspond to the simple main effect of the predicted outcome for each cognitive style.

* $p < .01$.

** $p < .001$.

related to *rationality* and those related to *intuition*) that was used as a mediator. A Base rate Sensitivity Index (BSI) was computed following Drozda-Senkowska (1997)¹⁰ and used as the dependent variable.

In line with the univariate analyses presented above, the Cognitive Style \times Predicted Outcome interaction significantly affected both RI (i.e., the mediator), $B_{\text{un}} = .75$, $t(62) = 9.28$, $p < .0001$ and BSI (i.e., the DV), $B_{\text{un}} = -.44$, $t(62) = -3.44$, $p < .001$. Adding RI (i.e., the mediator) to the model led to a predicted unique effect of RI on BSI, $B_{\text{un}} = -.94$, $t(62) = -5.54$, $p < .0001$, which suggests that the more rational the participants perceived themselves, the closer their estimates were to the presented base rates. Crucially, with the mediator in the model, the (direct) effect of the Cognitive Style \times Predicted Outcome interaction on BSI dropped below the level of significance, $B_{\text{un}} = .26$, $t(62) = 1.56$, $p < .13$. This is not the case if BSI is used as mediator predicting changes in self-perceptions (i.e., dependent variable) suggesting that people's use of base rates does not influence their self-perceptions, yet the latter influence the former. A Sobel test (Preacher & Leonardelli, 2001) confirmed indeed that the effect of the Cognitive Style \times Predicted Outcome interaction on BSI is mediated by RI ($z = -4.77$, $p < .0001$), suggesting that increased reliance on statistical reasoning is indeed reliably related to an increase in self-perceived rationality.

3.3. Discussion

Consistent with past research (see e.g., Sanitioso et al., 2006), our results show that inducing participants with the belief that an attribute is conducive of success leads to an activation of the working self-concept motivated by that attribute (i.e., rationality or intuition). The novelty is that this working self-concept subsequently influences base rate sensitivity in the L–E problem such that the more

rational the participants perceived themselves, the closer their estimates were to the presented base rates. Thus, the results seem to provide support for our general idea that motivated changes in self-perception can also influence broader information processing (i.e., not only the processing of information related to the self).

Nevertheless, the mechanisms that underlie these results remain unclear. In line with our initial hypothesis, it is plausible (yet not ascertained by any direct process measure) that participants' working self-concept influences their selective reliance on rational rather than intuitive system of reasoning. But an equally plausible explanation is that such influence occurs much earlier than during decision-making process *per se*. For instance, Balcetis (2009) recently showed that when the BR information has negative implications, people attend to it (as observations of their overt eye movements show) and use it less. Thus it is plausible that RCS-success (and ICS-failure) participants spent more time reading the base rate information and thus weighed it more heavily as compared to ICS-success (and RCS-failure) participants. To address this issue, time spent reading the base rate information and the individual case information, as well as the decision latencies were collected in Experiment 3. Evidence that our set of independent variables influences the latter indicator but not the former would provide support for the idea that the working self-concept influences decision-making and not selective attention during information uptake.

4. Experiment 3

4.1. Method

4.1.1. Participants and design

One hundred twenty-seven pre-medical students at Clermont University volunteered to participate in the study. They were randomly assigned to a 2 (problem type: congruent vs. incongruent) \times 2 (order of base rate information: before vs. after individuating information) \times 2 (induced cognitive style: rational vs. intuitive) \times 2 (predicted outcome: success vs. failure) between-subjects design.

4.1.2. Procedure and materials

During their break, the participants (all of them users of a medical library) were asked to participate in a series of short educational psychology studies. As the three studies

¹⁰ Base rate information was manipulated at within-subjects level in such a way that each participant provided two probability estimates (one in response to the congruent problem, the other in response to the incongruent problem). Consequently, we first computed odds ratios between each of these estimates and the presented base rate and then computed their logarithmic transformations so that the *ad hoc* DVs followed the normal distribution (Drozda-Senkowska, 1997). Finally, we calculated the mean of the two logarithmic transformations ($R = .91$). In short, the Base rate Sensitivity Index (BSI) reflects the degree of people's reliance on base rates (i.e., the closer people's estimates are to the presented base rates, the closer the value of the BSI is to 0). This transformation is important because it allows for collapsing the estimates generated in both the 30% and 70% conditions.

were (allegedly) independent of each other, they were free to stop at any time. None of the participants did. In reality, these computer-based studies (run using E-prime2 software) corresponded to the three distinct sections of the experimental protocol (i.e., experimental induction: rationality vs. intuition; self-perception measure; L-E problem solving). Before moving onto another section, the participants were explicitly asked whether they wanted to participate in another study.

The aim of the first study, presented to the participants in the form of an opinion poll about educational issues, was to experimentally induce the belief that rationality (vs. intuition) is conducive to success (vs. failure). The content of the scenario was identical to the one used in Experiment 1 except that the fictitious study was conducted among pre-medical students and the relevance of the outcomes was adjusted for this population (e.g., cognitive style ostensibly influences people's admission to their chosen medical specialty). All the participants then rated the extent to which they personally considered intuitive and rational cognitive styles to be predictive of academic and professional success on 7-point Likert-type scales (0 = *not at all*; 6 = *very much*).

The second study was introduced as a personality study in which the participants were asked to rate themselves on 19 traits including, as in Experiment 2, three rationality-related and three intuition-related traits. Trait order was randomly generated by the computer and the participants responded on 7-point Likert-type scales (0 = *not at all*; 6 = *very much*).

The third study was presented as a problem-solving session. The participants were asked to read the instructions carefully because the problem to be solved was to be presented in two parts of equal importance, the order of which was supposedly randomly determined by the computer. In reality, the order was counterbalanced in such a way that the part containing the base rate information appeared either first or second and the two parts never appeared simultaneously. This procedure (i.e., the computer-based version of Krosnick, Li, and Lehman (1990)) made it possible to measure the time devoted to reading the base rate versus to the case information. Once the participants had read both parts of the task and with the task-relevant information no longer available to the participants, they were asked to estimate the probability that the person described (Jean) was a lawyer by clicking on the appropriate box of an 11-point scale ranging from 0% to 100% (in increments of 10%). This procedure made possible to measure the decision latency.

Finally, the participants were thanked again and fully debriefed. One participant suspected the relationship between the different parts of the experimental protocol and the corresponding data was discarded from the analyses.

4.2. Results

4.2.1. Replication of basic findings

Verifications of the experimental inductions, $F(1,123) = 207.53$, $p < .001$, $\eta_p^2 = 0.63$ (see Table 1) and computed means for self-perceived rationality and intuition,

$F(1,123) = 196.81$, $p < .001$, $\eta_p^2 = .61$ were both influenced by the predicted three-way interaction between induced cognitive style, predicted outcome, and rated cognitive style. Moreover, the probability estimates yielded the predicted three-way interaction between problem type, induced cognitive style and predicted outcome, $F(1,126) = 10.69$, $p < .01$, $\eta_p^2 = .09$.

Decompositions of these two latter effects suggest that participants who had been induced to believe that RCS is success-conducive (or ICS failure-conducive) subsequently viewed themselves as more rational (and less intuitive, see Table 3) and relied more on base rates in their probability estimates (see Table 2) than those induced to believe that RCS is failure-conducive (or ICS success-conducive). Additional mediational analyses¹¹ and a significant Sobel test (Preacher & Leonardelli, 2001), $z = -4.48$, $p < .0001$, provide further support for the idea that the more participants perceived themselves as rational (as shown by computed Rationality Indexes, RI), the closer their estimates were to the given base rates (as indicated by computed Base rate Sensitivity Indexes, BSI).

4.2.2. Assessment of cognitive processes underlying base rate sensitivity

None of the $2 \times 2 \times 2 \times 2$ ANOVAs with base rates, base rate presentation order, cognitive style, and outcome as between-participants factors conducted on mean time spent reading base rate and case information respectively (i.e., the time between arriving at and leaving the page containing this information) revealed any meaningful between-conditions differences, $F_s < 1$.¹²

The same analysis conducted on decision latencies (measured in seconds) only revealed a significant two-way Cognitive Style \times Outcome interaction, $F(1,119) = 35.92$, $p < .0001$, $\eta_p^2 = .23$. The decomposition of this interaction suggests that RCS-participants' latencies were significantly longer in RCS-success ($M = 19$ s, $SD = 13$ s) compared to RCS-failure condition ($M = 9$ s; $SD = 7$ s), $F(1,119) = 15.70$, $p < .001$, $\eta_p^2 = .12$. ICS-participants' latencies were significantly longer in ICS-failure ($M = 19$ s, $SD = 15$ s) compared to RCS-success condition ($M = 7$ s, $SD = 6$ s), $F(1,119) = 20.43$, $p < .001$, $\eta_p^2 = .15$. Furthermore, additional mediational analyses and a significant Sobel test (Preacher & Leonardelli, 2001), $z = 5.04$, $p < .0001$ showed that the more rational participants perceived themselves to be (as shown by Rationality Indexes, RI), the longer were their decision latencies.

This suggests that there may be a theoretically plausible causal chain such as the desire to possess success-conducive (or failure-avoidant) attributes influences peoples' working self-concept in terms of rationality or intuition that subsequently influences people's tendency to adopt a rational reasoning system (i.e., resulting in judgments

¹¹ For the sake of brevity, we do not report hereafter the details of those analyses that were conducted exactly like those reported in Section 3.2.3. Please note that the Sobel test value testifies the extent to which conclusions of those analyses are reliable.

¹² These analyses revealed only that participants assigned to the conventional task order (i.e., base rate information followed by the individual case) spent more time reading the task than those assigned to the reverse order.

based on base rates) or intuitive reasoning system (i.e., resulting in judgments based on representativeness). As this reasoning would suggest, the effect of the Cognitive Style \times Outcome interaction on base rate sensitivity was indeed partially but significantly mediated by decision latencies (Sobel test $z = -2.31, p < .022$) such that the longer the participants took to generate their estimates, the closer these were to the given base rates.

4.3. Discussion

To sum up, our participants did not seem to allocate less attention to task features (i.e., base rate vs. case information) that were either consistent (see e.g., Ditto, Scepansky, Munro, Apanovitch, & Lockhart, 1998) or inconsistent (see e.g., Balcetis, 2009) with their current self-perception. In contrast, RCS-success and ICS-failure participants clearly engaged in more time-consuming decision-making resulting in increased base rate sensitivity, while RCS-failure and ICS-success participants' decision-making was quicker and resulted in a widespread bias toward representativeness.

Thus, despite the obvious difficulties associated with the interpretation of null findings, these results do not provide support for the idea that people's desire to see themselves in terms of attributes that are conducive to personal success (i.e., rationality vs. intuition) promotes selective attention mechanisms during the processing of the task features. But results relating to both decision latencies (i.e., indicators of the reasoning process) and the use of base rates (i.e., reasoning output) as well as the fact that the former significantly mediated the latter are all clearly consistent with the idea that the desired self influences participants' reasoning in the L–E task.

However, it should be remembered that there is no need to engage in the rational reasoning when no conflict between an individual description and the provided base rates (i.e., congruent problems) is involved. Indeed, in this case, the intuitive response based on representativeness still yields reasonable judgments. Thus our initial claim about the extent to which changes in self-perceptions are specifically involved in the choice of the reasoning system used remains unproven since decision-latencies for congruent or incongruent problems were statistically identical. Indeed, our data are also consistent with the idea that participants simply applied general reasoning strategies or approaches to the problem (see e.g., Schwartz, Strack, Hilton, & Naderer, 1991; Zukier & Pepitone, 1984) independently of whether or not the problem actually calls for rational processing. Experiment 4 was designed to rule out this alternative explanation.

5. Experiment 4

In this experiment, each participant had to solve several congruent and incongruent problems (see e.g., De Neys & Glumicic, 2008). To further ensure that people's working self-concept (and the reasoning style it leads to) has its roots in the desired self, the self-relevance of the outcome was manipulated: participants were told that RCS (vs. ICS)

leads to either academic and professional success or success in problem solving. In line with the idea that people only tune their temporary self-perceptions to characteristics leading to highly self-relevant outcomes (see e.g., Markus & Kunda, 1986), we hypothesized that participants who believed that rationality leads to academic and professional success would see themselves as more rational and consequently be more sensitive to base rates (to be confirmed by statistical mediation) than those who viewed rationality as conducive to success in the problem-solving task presented in the experimental situation (i.e., a domain that is much less self-relevant). Importantly, the possibility that our effects result from general strategies can be ruled out if the interaction between cognitive style and self-relevance of success on participants' probability estimates (and decision latencies) is constrained to incongruent problems.

Finally, to assess the extent to which increased reliance on base rate information in the L–E problem subsequently transfers to performance on a problem that calls for more sophisticated probabilistic reasoning, the tasks that the participants had to solve also included Kahneman and Tversky's (1972) cab problem.

5.1. Method

5.1.1. Participants and design

Sixty-four pre-medical students at Clermont University participated in the study in exchange for financial recompense. They were randomly assigned to a 2 (induced cognitive style: rational vs. intuitive) \times 2 (self-relevance of success: high vs. low) \times 2 (type of problems: incongruent vs. congruent) mixed-factorial design. The last factor was manipulated at a within-subjects level.

5.1.2. Procedure and materials

As in Experiment 3, participants took part in a series of educational psychology studies. In addition to the previously used sections of the experimental procedure, two filler tasks and the cab problem were introduced. The first (the belief-induction) and the last (the cab problem) tasks were introduced using paper and pencil, whereas all the other parts were computer-based (run using E-prime1 software).

As in Experiment 1, the belief in rationality or intuition was induced through the explanation of a fictitious study. The only difference from the scenarios in the earlier experiments consisted in the induction of the self-relevance of success (high vs. low), which took the following form:

“[...] Using a large array of tests and scales, researchers performed a comprehensive assessment of each participating individual, while also tracking their performance on various kinds of problems (vs. their academic and professional performance throughout the five years that followed their enrollment in the medical program).

The most novel findings of this study relate to individuals' general disposition (also called cognitive style) towards either rationality or intuition. More specifically, it showed that individuals with a rational (vs.

intuitive) cognitive style (i.e., one characterized by a high reliance on reason and facts [vs. instincts and feelings] in their everyday judgments and decisions) achieve better performance. Among other relevant indicators, they tend to make fewer errors (vs. diagnostic errors). [...].”

After they had explained why they thought these findings might be true, all participants rated the extent to which they personally considered intuitive and rational cognitive styles to be predictive of success on 5-point Likert-type scales (0 = not at all; 4 = very much).

Participants underwent next a filler task presented to them as a long-term memory test. They were asked to identify several European capitals as quickly and accurately as possible in a forced-choice task. This was followed by a self-perception task identical to that used in the previous studies. The computer generated 25 traits in a random order and participants' responses were collected on 5-point Likert-type scales (0 = not at all; 4 = very much).

The following study was presented as a many-problems problem-solving session. Participants were also informed that they had to indicate a solution to each problem by clicking on a scale ranging from 0% to 100% (the response was recorded to the nearest 1%, and check marks were displayed at every 10% along the scale, from 0% to 100%). To familiarize the participants with the response scale, they were requested to click on several given values and were provided with feedback concerning the accuracy of their mouse-clicks before starting the problem-solving session. This training also served as a filler task aimed at increasing the delay between the self-perception measure and the L–E problem solving session. Participants then proceeded to the experimental session and had to solve eight problems modeled on the L–E task in a way similar to De Neys and colleagues (see e.g., De Neys & Glumicic, 2008). Half of these problems were incongruent. All problems were presented with base rates that varied slightly around 30/70 – more precisely, base rate ratios were of 26(74)/100, 27(73)/100, 28(72)/100, 29(71)/100, 31(69)/100, 32(68)/100, 33(67)/100, and 34(66)/100. The computer generated the problems in a pseudo-random order – controlling for different aspects of the problems (e.g., gender of the person depicted, position of the target categories in the presentation of the problem, etc.). All information remained on the screen until the participant indicated his/her estimate. Participants could change their answer as many times as they wished before validating their final answer.

After performing another filler task (answering a few bogus questions about their impressions of the L–E problem session), the participants were handed a paper-version of the Kahneman and Tversky (1972)'s cab problem.¹³ Their task was to estimate the probability (out of 100) that

the cab involved in the accident was green. A correct normative answer of 41% indicates that participants have combined the base rate and indicant information appropriately. In contrast, the most common response (i.e., 80%) reflects the exclusive use of indicant information that corresponds to the witness' credibility (see Bar-Hillel, 1980, p. 220).

At the end of all tasks, the participants were thanked, paid and fully debriefed. One participant suspected the relationship between the different parts of the experimental procedure and one participant did not finish the experiment. Their data were subsequently discarded from the analyses.

5.2. Results

5.2.1. Experimental control and self-perception results

Our experimental inductions were successful in the sense that the participants came to believe the relationship that was induced experimentally between cognitive style and success regardless of the self-relevance of the domain of success (i.e., academic and professional vs. problem solving).¹⁴

In line with previous analyses, the computed rationality indexes were influenced by the induced cognitive style, $F(1,61) = 77.07, p < .001, \eta_p^2 = 0.57$. This main effect was also included in Cognitive Style \times Self-relevance of Success interaction, $F(1,61) = 53.06, p < .001, \eta_p^2 = 0.48$. Its decomposition suggests that the main effect of cognitive style was primarily due to the participants believing that a given cognitive style leads to academic and professional success. Indeed, while these participants shifted their self-perceptions in line with the success-conducive cognitive styles (i.e., RCS participants viewed themselves as more rational than did ICS participants [$M = 1.71; SD = .85$ vs. $M = -1.44, SD = 1.03$], $F(1,58) = 129.04, p < .001, \eta_p^2 = .69$) this was not (significantly) the case for the participants believing that a given cognitive style leads to success in problem solving ($M = .02; SD = .56$ for RCS-success participants vs. $M = -0.27, SD = .56$ for ICS-success participants). This result pattern is consistent with the idea that a desired outcome has to be highly self-relevant in order to produce self-enhance adjustments in the working self-concept (see e.g., Markus & Kunda, 1986).

5.2.2. Reasoning in the L–E problems

The computed mean base rate sensitivity indexes and mean latencies for both congruent and incongruent problems were subjected to repeated-measures ANOVAs with cognitive style and self-relevance of success as two between-subject factors.

¹³ Two cab companies, named Blue and Green (to reflect the color of the cabs they run), operate in a given city. Eighty-five percent of the cabs in the city are Blue, and the remaining 15% are Green. A cab was involved in a hit-and-run accident at night. A witness later identified the cab as a Green cab. The court tested the witness's ability to distinguish between Blue and Green cabs under nighttime visibility conditions. It found that the witness was able to identify each color correctly about 80% of the time, but confused it with the other color about 20% of the time.

¹⁴ ANOVAs aimed at verifying the effectiveness of the experimental inductions, with cognitive style presented as conducive of success, self-relevance of success, and rated cognitive style as factors yielded only a two-way interaction between induced cognitive style and rated cognitive style, $F(1,58) = 68.51, p < .001, \eta_p^2 = 0.54$; these factors did not interact with the self-relevance of success. Decomposition of the interaction showed that all RCS-success participants rated RCS as more predictive of success than ICS ($M = 3.37; SD = .93$ vs. $M = 2.00, SD = .98$), $F(1,58) = 40.96, p < .001, \eta_p^2 = .41$, and ICS-success participants considered ICS as more predictive of success than RCS ($M = 3.25, SD = .84$ vs. $M = 2.16; SD = .95$), $F(1,58) = 29.98, p < .001, \eta_p^2 = .33$.

With regard to BSI, this analysis revealed a significant main effect of the type of problem, $F(1,58) = 83.44$, $p < .001$, $\eta_p^2 = .59$ and of the cognitive style, $F(1,58) = 11.54$, $p = .001$, $\eta_p^2 = .17$. It also revealed significant two-way interactions: Problem Type \times Cognitive Style, $F(1,58) = 15.29$, $p < .001$, $\eta_p^2 = .21$, and Cognitive Style \times Self-relevance of Success, $F(1,58) = 7.46$, $p < .01$, $\eta_p^2 = .11$. These latter effects were also qualified by the expected Problem Type \times Cognitive Style \times Self-relevance of Success interaction, $F(1,58) = 13.40$, $p = .001$, $\eta_p^2 = .19$ (see Table 4).

The analysis of mean decision latencies yielded similar results: they were also influenced by significant main effects of the type of problem, $F(1,58) = 141.14$, $p < .0001$, $\eta_p^2 = .71$, and of the cognitive style, $F(1,58) = 4.79$, $p < .05$, $\eta_p^2 = .08$, which were also included in the two-way Problem Type \times Cognitive Style, $F(1,58) = 5.56$, $p < .05$, $\eta_p^2 = .09$ and Cognitive Style \times Self-relevance of Success interactions, $F(1,58) = 17.20$, $p < .001$, $\eta_p^2 = .23$. Yet the three-way Problem Type \times Cognitive Style \times Self-relevance of Success interaction did not reach the conventional level of significance, $F(1,58) = 2.78$, $p = .10$, $\eta_p^2 = .05$ (see Table 4).

In order to meaningfully test our predictions, we decomposed the three-way interactions on BSI and decision latencies in a number of ways that differed from those reported in Table 4. First, testing the simple main effect of the type of problem in each experimental condition showed that this effect was significant (i.e., the participants' estimates were closer to the given base rates on congruent than on incongruent problems, all $p < .001$, all $\eta_p^2 > .27$) in all the conditions except among the participants who believed that RCS leads to academic and professional success. These participants' estimates were very close to the given base rates on both the congruent and incongruent problems. An identical analysis performed on latencies suggested that the participants in all the experimental conditions seemed, at least, to detect the conflict between the individual descriptions and the given base rates as the significantly longer latencies observed on the incongruent compared to the congruent problems suggest (all $p < .001$, all $\eta_p^2 > .20$).

Second, the effect of the Cognitive Style \times Self-relevance of Success interaction on BSI was significant only for incongruent problems $F(1,58) = 11.23$, $p < .01$, $\eta_p^2 = .16$. The same interaction on latencies was significant for both incongruent, $F(1,58) = 12.10$, $p < .01$, $\eta_p^2 = .17$ and

congruent problems, $F(1,58) = 10.65$, $p < .01$, $\eta_p^2 = .16$. However, it should be noted that this was primarily due to an unexpected crossed-interaction pattern (see Table 4).

Concerning the crucial incongruent problems, the main effect of the self-relevance of success for each style followed the expected pattern. RCS participants not only exhibited longer latencies, $F(1,58) = 6.43$, $p < .05$, $\eta_p^2 = .10$, but were also more base rate sensitive, $F(1,58) = 5.38$, $p < .05$, $\eta_p^2 = .09$, when they had been led to believe that rationality promotes academic and professional success than when they had been told that it promotes success in problem solving. In contrast, ICS participants exhibited shorter latencies, $F(1,58) = 5.67$, $p < .05$, $\eta_p^2 = .09$, and were less base rate sensitive $F(1,58) = 5.87$, $p < .05$, $\eta_p^2 = .09$, when they believed that intuition promotes academic and professional success than when they believed that it promotes success in problem solving. Also importantly, this effect on base rates was reliably dependent on decision latencies, $z = -3.46$, $p < .0001$, with the result that the longer the participants took to generate their probability estimates, the closer these estimates were to the given base rates. Note that this was not the case for congruent problems.

The additional mediational analyses also showed that in incongruent (but not in congruent) problems, Cognitive Style \times Self-relevance of Success interaction on decision latencies tended to be reliably dependent on self-reported rationality, $z = 1.81$, $p = .069$, such that the more rational participants perceived themselves to be, the longer were their decision latencies. The same effect on base rate sensitivity also depended on self-reported rationality, $z = -4.30$, $p < .0001$ such that the more participants perceived themselves as rational, the closer these estimates were to the given base rates. Again, this was not the case for congruent problems.

5.2.3. Performance on the cab problem

The participants' mean probability estimates were analyzed in a Cognitive Style \times Self-relevance of Success between-subject ANOVA, which yielded a significant main effect of cognitive style, $F(1,61) = 4.87$, $p < .05$, $\eta_p^2 = .08$. This factor was also present in a significant two-way Cognitive Style \times Self-relevance of Success interaction, $F(1,61) = 3.98$, $p = .051$, $\eta_p^2 = .06$.

The decomposition suggests that the estimates generated by the participants who believed that cognitive style influences academic and professional success produced

Table 4

Base rate sensitivity and decision latencies as a function of induced cognitive style, self-relevance of success and problem type.

		Academic success (high self-relevance)				Task success (low self-relevance)			
		RCS	ICS	F	η_p^2	RCS	ICS	F	η_p^2
BSI	Congruent	.06 (.15)	.49 (.62)	6.89*	.11	.19 (.40)	.26 (.52)	.21ns	–
	Incongruent	.11 (.32)	1.31 (.96)	26.82**	.32	.66 (.62)	.76 (.46)	.19ns	–
Latencies	Congruent	17.99 (6.46)	13.64 (3.98)	6.73*	.10	13.13 (2.75)	16.51 (4.71)	4.09*	.06
	Incongruent	34.50 (6.33)	21.63 (9.07)	18.29**	.24	26.75 (8.60)	28.68 (9.08)	.41ns	–

Note. Standard deviations are given in parentheses. Presented F_s corresponds to the simple main effect of cognitive style at each level of outcome relevance.

* $p < .01$.

** $p < .001$.

answers significantly closer to the normatively correct answer in the RCS condition ($M = 49.40$; $SD = 28.75$) than in the ICS condition ($M = 76.25$; $SD = 18.93$), $F(1,58) = 8.83$, $p < .01$, $\eta_p^2 = .13$, while cognitive style did not affect the estimates produced by the participants who believed that cognitive style influences success in problem solving, ($M_s = 69.33, 70.69$; $SD_s = 26.96, 25.21$), $F(1,58) = 0.02$, ns . As can be seen, the simple main effect of the self-relevance of success was also significant in the RCS participants, with the result that the estimates produced by the RCS participants who believed that cognitive style influences academic and professional success were significantly closer to the normatively correct answer than those produced by participants who believed that RCS promotes success in problem solving, $F(1,58) = 4.72$, $p < .05$, $\eta_p^2 = .08$.

Overall, the results reported above suggest that some cognitive transfer to the more complex cab problem occurs. A closer examination of the responses reveals that this transfer relates to an increased reliance on base rate information and a lesser reliance on indicant information (a phenomenon that is commonly observed with this paradigm). It does not, however, result in the appropriate Bayesian combination of both types of information since only three participants (i.e., 4.7%) provided the normatively correct answer. It should be noted that this percentage is roughly the same as the usual success rate in this task (see e.g., Bar-Hillel, 1980).

5.3. Discussion

The Cognitive Style \times Self-relevance of Success interaction on participants' probability estimates in multiple L–E problems was, as predicted, constrained to those that were incongruent, which runs counter to the alternative general strategy account. The corresponding results on decision latencies, although less clear, also failed to support a general strategy account. In fact, the interaction is not constrained to the incongruent problems, but the corresponding interaction for the congruent problems is due to higher latencies in the ICS-success condition in the low self-relevance condition. Additionally, the interacting effect of Cognitive Style \times Self-relevance of Success on participants' decision latencies and probability estimates (BSI) was only indirect (i.e., reliably dependent on participants' self-reported rationality (RI) in incongruent problems. Also, such changes in participants' working self-concepts only occurred when success-conducive cognitive style was of high self-relevance (i.e., led to academic and professional success, as opposed to problem solving that is much less relevant for pre-medical students' self-concept).

In summary, the observed differences in these results support our hypothesis that, for incongruent problems, the working self-concept activated by an individual's desired self-perception guides which system of reasoning is used. In addition, our results also suggest that such influence might have a broader impact on reasoning or at least, it is not strictly limited to judgments related to the specific task at hand. Indeed, the increased use of base rate information observed in our experiments on the L–E problems appears similar to that observed in the cab problem.

6. General discussion

In line with the general idea of the power of the desired self, results reported above have consistently shown that people's desire to view themselves in terms of attributes which lead to personal success (or help them avoid failure) causes them to adjust their temporary self-perceptions (i.e., working self-concepts, see e.g., Markus & Nurius, 1986; Markus & Ruvolo, 1989) of their own rational or intuitive natures. Because no studies have previously investigated motivated changes in self-perception along these dimensions, our findings extend research on the processing of self-relevant information (see e.g., Dunning, 1999; Kunda, 1990, 2000, for reviews).

The force and the novelty of these results lies in the fact that they repeatedly showed that people's desire to view themselves in terms of attributes leading to personal success (or avoiding personal failure), through the working self-concept that it entails, influences their information processing considered in a broader sense (i.e., not just the processing of information that is self-relevant in terms of its content). Indeed, it seems to influence people's cognitive performance in ostensibly unrelated reasoning tasks (i.e., L–E problems [Experiment 1–4] and the cab problem [Experiment 4]). Both the reasoning output we obtained from our participants and the process-related data we observed are consistent with this line of argument.

As concerns the reasoning output from the L–E problem, all the studies revealed that participants who believed that rationality leads to personal success (or avoids personal failure) relied more on base rates than those who believed that intuition leads to personal success (or avoids personal failure).

As far as the underlying processes are concerned, our findings seem to be somewhat inconsistent with the possibility that the increased base rate sensitivity was due to selective attention mechanisms during the processing of the task features. Indeed, in Experiment 3 we observed no differences in the times spent reading the base rates and the individual case information across conditions. Also, the decision latencies from Experiment 4 suggest that the participants successfully attended to both base rate and case information as they systematically displayed longer latencies for incongruent as compared to congruent problems. Taken together, these results do not provide any support for the idea that individuals strategically allocate attention to the criterion of judgment that either matches (Balcetis, 2009) or runs counter to (Ditto & Lopez, 1992) the desired self.

Instead, these results are much more consistent with the idea that differences in the reasoning judgments resulted from differences in processing styles (see e.g., Barbey & Sloman, 2007; De Neys, 2006a; Evans, 2003; Sloman, 1996a). Indeed, Experiments 3 and 4 both showed that the longer participants took to generate their probability estimates, the closer their estimates were to base rates (as further confirmed by statistical mediation). Critically, when participants solved both congruent and incongruent problems (i.e., Experiment 4), this pattern was limited only to the incongruent problems. This pattern of

results therefore provides strong evidence that such differences in processing styles were unrelated to general strategies or approaches to the task (Schwartz et al., 1991; Zukier & Pepitone, 1984) and that participants would have applied them independently of whether the problems called for a genuine use of the rational system. More importantly, this is consistent with Barbey and Sloman (2007)'s argument that a rule-based system (i.e., rational reasoning system) plays an essential role in base rate "respect".

A finding that is more relevant with regard to the direct role of the working self-concept in these processes was obtained in Experiment 4. Its results revealed a shift of the working self-concept toward rationality (or intuition) only when this dimension was believed to be conducive to success in domains that were highly relevant to the individuals in question. Moreover, in this experiment, and as had been observed in the previous studies, both decision latencies (i.e., reasoning processes) and use of base rates (i.e., reasoning output) were fully mediated by people's shifts toward self-perceived rationality (and never the other way around), with the result that the more rational they considered themselves to be, the clearer was their subsequent preference for the rational system.

Such results can explain why past studies manipulating general approaches to the task (Schwartz et al., 1991; Zukier & Pepitone, 1984) have revealed more modest effects than those observed in Experiments 1–3. Additionally, it may also explain why the instructions concerning success in problem-solving seemed to be somewhat inefficient in our Experiment 4 much the same way as in De Neys, Vartanian, and Goel (2008) who instructed their participants to think as statisticians (i.e., used statistical instructions similar to those employed by Schwartz et al. (1991)). Indeed, as we also found, instructions of this type did not elicit any particular increase in base rate sensitivity compared to classical findings obtained using this very same paradigm (see also, e.g., De Neys & Glumicic, 2008).¹⁵ One possibility is that such differences across experiments might reflect the fact that people adopt particular reasoning systems more willingly if those systems (or conclusions that systems allow to draw) appeal to their current self-conceptions (see also Kunda, 1990, 2000; Molden & Higgins, 2005). Consistent with this reasoning, Zukier and Pepitone's Study 2 clearly showed that medical residents were much more sensitive to base rates than first-year medical students (but see also Dawes, Faust, and Meehl (1989), for arguments against the causal link between social roles or contexts and particular types of reasoning).

Crucially, the fact that a statistical mediation by the rational working self-concept was again only observed on incongruent problems is consistent with our initial claim that individual's desired self-perception in a given context guides which reasoning system is used when problems can be solved by both the rational and intuitive systems. Thus our results also contribute to the ongoing scientific debate among dual-theorists about the interaction of these two systems.

Indeed, some authors (Evans, 1984, 2003; Kahneman (2002) cited by De Neys et al. (2008)) suggest that widespread reliance on representativeness itself results from a failure of the rational system to detect the conflict between the intuitive response and the one favored by probability. Our data showed that independent of their working self-concepts, people are clearly efficient at detecting conflicts between the rational and intuitive systems (see e.g., De Neys et al., 2008; Denes-Raj & Epstein, 1994; Epstein, 1994; Sloman, 1996a). This is consistent with results observed by De Neys et al. (2008) showing that people's brain area involving conflict-detection was consistently activated during the generation of probability estimates in incongruent L-E problem, regardless of whether their responses resulted from the use of both base rates or representativeness. In sum, our results run against the bias as *detection-failure* point of view mentioned above. Having said that, the most obvious and immediate limitation of the present paper is that it does not provide any further answer to the question of how exactly self-perceptions influence the interaction between the two reasoning systems.

It is plausible that in participants with the rational working self-concept, a detected conflict triggers more cautious decision-making aimed at avoiding errors of commission (Molden & Higgins, 2008) that brings rules into play more readily, because "rules provide a firmer basis for justification than do impressions" (Sloman, 1996a, p. 15; see also Epstein, Lipson, Holstein, & Huh, 1992). Under such conditions, the conclusions that they come to on the basis of such rules can more efficiently override conclusions based on representativeness.

Following from the general idea that judgmental biases are due to a specific executive failure of inhibition in working memory (De Neys & Franssens, 2009; De Neys & Glumicic, 2008; De Neys et al., 2008; but see also, e.g., Cassotti & Moutier, 2010; Moutier & Houdé, 2003), it is also plausible that the working self-concept may play a role in inhibition of intuitive beliefs. The fact that the rational working self-concept promoted base rate sensitivity primarily in incongruent problems is consistent with such a possibility as De Neys and colleagues (2008) found that it was on such problems that the inhibition area (as opposed to the conflict-monitoring area) was activated only when people avoided responses resulting from representativeness. In short, future research will be required to differentiate between these interpretations.

To conclude, it should be remembered that people are capable of coding frequencies and underlying distributions of behaviors in the population satisfactorily (Epley & Dunning, 2006; Hasher, Zacks, Rose, & Sanft, 1987; Nisbett & Kunda, 1985) and that they do not seem to lack statistical sophistication (Barbey & Sloman, 2007; De Neys, 2009). It should also be noted that, as anticipated within the parallel dual-approach perspective (e.g., De Neys, 2006a, 2006b; Denes-Raj & Epstein, 1994; Epstein, 1990, 1994; Epstein & Pacini, 1999; Sloman, 1996a), people frequently detect conflict between the two systems. Taken together, these different observations lead us to believe that the desired self through the working self-concept that it entails (Markus & Nurius, 1986; Markus & Ruvolo, 1989) plays an important role in resolving efficiently this conflict.

¹⁵ Of course, such a conclusion remains tentative due to clear difficulties in comparing data from two distinct experiments as well as the small sample size reported in De Neys et al. (2008).

Given the fact that desired self-perceptions in terms of rationality might be fairly short-lived (as they are contingent on the accessibility of self-knowledge that confirm the desired self-perception), educational programs or training procedures designed to improve people's use of base rate information might also examine the question of how to render people's rational self more appealing and consequently more chronically accessible.

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