



Dual-System Mechanisms Involved in Risk Estimations and Punishment Proposals for Rape

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Dual system models assume that human cognition is carried by two cognitive processing sub-systems: System 1, which operates fast, automatically, and typically makes inferences based on heuristics, and System 2, which processes information in a controlled, analytical, manner. The present experiment investigates the role of several mechanisms from dual-system models, in evaluations related to a real rape case. More specifically, we found that, in persons that are more inclined to use System 1 (i.e., have an intuitive cognitive style): (a) fluency heuristic, that is, the ease of retrieving examples of rape cases, influences the estimated probability of a new rape case; (b) the increased salience of information and emotion related to a rape case automatically influences probability estimates for a new rape case and estimations of appropriate punishment for rape. Furthermore, we unsuccessfully tested a “debiasing” method, which aimed to reduce the estimated probability of a new rape case, by manipulating retrieval fluency. We discuss theoretical implications of these results for dual-system models and risk perception, and practical implications for reducing dysfunctional reactions (e.g., extreme distress) associated with rape-related risk perception.

Keywords: fluency heuristic; availability; attribute substitution; dual system models; rape

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Introduction

Adaptation involves, by definition, risk management. As a result, the human cognitive system has certain features that make it particularly competent in detecting and responding to risks, especially to those with intense negative consequences (e.g., Taleb, 2014). A specific area where the cognitive dynamics of risk detection and management have widespread implications is how people appraise the risk of victimization from criminal activities. This results from the fact that risk appraisals regarding criminal activities influence (a) individual emotions and behaviors regarding potential risk situations and (b) policies and practices for prevention and coercion of crimes (e.g., Kahneman & Frederick, 2005; Kahneman, Schkade, & Sunstein, 1998). However, most previous studies on the cognitive mechanisms relevant for risk perception have focused on neutral or health-related domains (e.g., disease vulnerability, consumer behavior). Further, many of these studies have been conducted in laboratory settings and/or concerning hypothetical scenarios. As a result, far less is known about how these processes function in emotionally salient, socially-sensitive domains like sexual violence,

regarding real cases, where emotion, media coverage, and moral judgment may strongly interact with cognitive mechanisms. These represent notable gaps in the literature that the present study seeks to address.

One of the crimes with the most severe and pervasive negative consequences for victims is rape. A recent meta-analysis has found that sexual assault is significantly associated, in victims, with a very wide range of psychopathology, the strongest association being with suicidality (Dworkin, Menon, Bystrynski, & Allen, 2017). Furthermore, sexual assault produces significant consequences (e.g., apprehension, distress, avoidance behaviors), not only in victims, but in many people, especially women, that perceive an increased risk of becoming victims (e.g., Custers & Van den Bulck, 2013; Warr, 1985). A survey shows, in this sense, that 11% of the women from the European Union state members have been victims of some form of sexual violence since the age of 15 and that a much broader range of women (53%) exhibit avoidance behaviors caused by the fear of being physically or sexually assaulted (European Union Agency for Fundamental Rights, 2014). Thus, in order to understand

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adaptive and maladaptive emotions and behaviors related to the risk of becoming a rape victim, it is necessary to clarify the cognitive processes involved in the evaluation of rape likelihood.

Cognitive processes involved in the evaluation of rape also play a role in the management of specific rape cases by the judicial system. This happens because cognitive processes influence public perceptions of crimes, and these public perceptions influence, in turn, decisions taken in the process of managing specific cases. For instance, in the practice of European Court of Human Rights (ECHR), public opinion is considered a criterion for estimating the dangers for the public order posed by a crime. The cognitive mechanisms investigated in the present study are derived from a dual system (or dual process) perspective, which is one of the most influential theoretical frameworks in cognitive and social psychology.

Dual System Models

Dual system (or dual process) models have been successfully used for explaining a large variety of phenomena in judgment, decision, and many other related fields (e.g., Kahneman, 2011; Strack & Deutsch, 2015; Tversky & Kahneman, 1973). Although there are notable differences between specific models, they all agree that human information processing is carried by two cognitive sub-systems or two families of cognitive processes: System 1 (or type 1 processing), which comprises automatic, fast, intuitive and, typically, non-conscious operations, and System 2 (or type 2 processing), which deals with information in a more controlled, slow, analytic, and conscious manner.

System 1's main advantage is its capacity to give rapid responses based on very limited amounts of information, which is essential for adaptation to a dynamic environment. However, due to the very fact that system 1 takes limited amounts of information into account, in some circumstances its responses are inaccurate. One of the core mechanisms that enables this fast responding capacity is *attribute substitution* (Kahneman & Frederick, 2005): When we have to answer a question for which the response is difficult to compute, system 1 substitutes the question with a related one, but which has a readily available response. For example, as we will detail in the following sections, questions like *How likely is that a specific event will happen?* are replaced by *How easy is for me to remember past instances of that type of event?* In other words, attribute substitution replaces the level of likelihood with the level of remembering fluency. Attribute substitution's workings lead to several specific heuristics (i.e., simple, fast, and frugal rules of inference and decision making; Gigerenzer & Gaissmaier, 2011; Kahneman, 2011), some of which will be detailed below.

In contrast, system 2's main advantage is its capacity to integrate and analyze more pieces of information, increasing, thus, the chances of giving appropriate responses. However, in order to give appropriate responses, system 2 has to have sufficient time, information, and cognitive resources (e.g., working memory capacity). If these requirements are not met, the final response will be the one given by system 1, or, at least, will be strongly influenced by system 1 (Evans & Stanovich, 2013; Jurchis & Opre, 2018). Several studies have shown that people vary in their propensity to use system 1 or system 2. That is, some are more likely to use system 1 in order to solve a problem, to make an estimation etc., while others are more inclined to use system 2 (e.g., Frederick, 2005).

Availability and Fluency Heuristics

Availability heuristic refers to the fact that the level of availability in memory of information regarding a specific subject influences different inferences regarding that subject. In other words, when making an inference, not only the content of information that sustains the inference matters, but also how available or unavailable is that information in memory. In a seminal study, Tversky and Kahneman (1973) asked participants to estimate whether specific consonants (e.g., K, L) are more likely to appear as the first or as the third letter in a word. Because examples of words that begin with a letter are more available and easier to retrieve compared to words that contain the same letter in the third position, participants estimated that there are more words that begin with the target consonants, than words containing them in the third position. This pattern of responses emerged despite the fact that all consonants presented in the study appear, objectively, more frequently in the third than in the first position. Thus, participants were not using the objective frequencies of words, but rather the availability of specific examples of words. Several studies have shown that emotionally-loaded contents tend to have a higher level of availability, compared to affectively-neutral information, and, accordingly, the former tend to achieve a higher influence in judgments. Lichtenstein, Slovic, Fischhoff, Layman, and Combs (1978) found that people tend to evaluate deaths caused by dramatic, sensational, events, as more frequent than those caused by more ordinary, non-spectacular, events (e.g., homicides were evaluated as more common than deaths produced by stomach cancer, despite the fact that their objective frequencies are reversed; see, for further analyses, Slovic, Fischhoff, & Lichtenstein, 1982, and Slovic, Finucane, Peters, & MacGregor, 2007).

Other studies have focused on not directly manipulating the availability of memory contents, but rather the fluency of retrieving contents from memory. They found that, when judging a piece of information on various dimensions (e.g., plausibility, probability, importance etc.), people are influenced by the *ease of retrieving* the judged information or information related to it. Schwarz et al. (1991) asked participants to retrieve, depending on the condition, six or 12 situations in which they behaved assertively. Subsequently, they had to evaluate themselves on several dimensions, including their general level of assertiveness. Finally, participants reported how difficult it was to retrieve those six or 12 situations. The results have shown that participants who remembered six situations of assertive behavior rated themselves as more assertive, compared to those who remembered 12 situations. The explanation is that it is easier to retrieve six examples, compared to 12. Accordingly, based on this experienced fluency of retrieval, participants in the six examples condition inferred that they are quite assertive, since it is so easy to remember situations in which they behaved assertively. The opposite process took place for participants in the 12 examples condition. Thus, in this situation, the experienced ease of retrieval, not only the retrieved contents, influenced participants' evaluations. This phenomenon has been replicated in various situations, showing that, for instance, people consider themselves as less vulnerable to heart disease, after retrieving eight risk behaviours than after retrieving three risk behaviours (Rothman & Schwarz, 1998) or that people who brought eight arguments for an idea have lower confidence in that idea, compared to people who brought only two arguments for it (Petty, Brinol, & Tormala, 2002; see Weingarten &

Hutchinson, 2018, for a recent meta-analysis sustaining the phenomenon).

Previous research has shown that system 1 processes can be involved in judgments of risks. For instance, fluency of retrieving vulnerability factors influences risk estimates (Rothman & Schwarz, 1998) and attribute substitution replaces, for instance, the question *How likely is a negative event to happen?* with *How strongly do I feel about that potential event?* (Kahneman, 2011). The present study aims to test the influence of these mechanisms in a practically-relevant context, which regards people's estimation of the probability of a specific crime (rape) and their proposals of appropriate punishments for rape.

The Present Study

The present study had two main objectives: (1) to test an intervention procedure that could decrease the perceived probability of rape and (2) to explore in more detail whether the effects of availability and affect on rape probability estimates and punishment proposals result from system 1 processes.

We explored the first objective by asking participants to remember three specific rape cases, one specific rape case, or no rape case. Previous studies show that the process of retrieving more instances from a category is associated with higher retrieval difficulty, which is automatically interpreted as a lack of availability of exemplars. In line with these results, we expected that (H1) *participants asked to remember three rape cases will estimate lower probabilities for rape than participants asked to remember one rape case or no rape case*.

Regarding the comparison between the 'one case' and 'no case group', we did not have a specific hypothesis, because there could be involved two phenomena that would yield opposite results. The first one would be that remembering one rape case could activate a vivid representation of that case, which, due to the availability heuristic, should lead to increased estimates for the 'one case' group. However, if remembering one rape case is experienced as difficult by a significant proportion of participants, the 'one case' group could give lower probability estimates.

In order to explore in more detail how retrieving rape cases influences the estimated probabilities for rape, we measured directly retrieval fluency, for participants in the 'one case' and 'three cases' groups. Thus, regarding the second objective, if fluency influence probability estimates through an intuitive heuristic, pertaining to system 1, then fluency of retrieving specific rape cases should predict rape probability, but only for participants that use preferentially system 1. Thus, we hypothesized that (H2) *cognitive style (intuitive vs analytic) will moderate the relationship between difficulty of retrieving rape cases and estimates of rape probability*.

Finally, we tested more directly whether the postulated mechanism of attribute substitution influences estimates of rape probability and punishments proposed for rape. If punishments and probabilities are substituted by system 1 with the level of availability of rape cases and with the affective reaction to rape cases, it means that rape probability estimations and rape punishments have a common source when people rely on system 1. Thus, we hypothesized that (H3) *the association between rape probability estimates and rape punishment will be significantly stronger for participants with an intuitive cognitive style, than for participants with an analytical cognitive style*.

Methods

Design

The design for testing H1 is an experimental one. The independent variable is the number of retrieved cases, with three conditions: G0 = no rape case requested, G1 = retrieve one rape case, and G3 = retrieve three rape cases. The dependent variable is the rape probability estimation.

The design used for hypothesis H2 is correlational. In our model, the fluency of retrieving rape cases represents the predictor and the rape probability estimation is the criterion/dependent variable. We also test whether this relation is moderated by cognitive style with the moderating variable indicating, at the two extremes, either an intuitive style or an analytical style.

For testing H3, the design used is also correlational, where the independent variable is cognitive style, with two levels: intuitive style and analytical style. The dependent variable is the association between the estimated probability of rape and the punishment for rape.

Participants and Procedure

The study was conducted following the APA Ethical Guidelines and the regulations of the first author's University Ethical Committee. All participants gave informed consent for participation, and were informed that they can withdraw from the study at any moment.

For this study, we recruited participants that attended a previous study on rape and that agreed to be contacted for future studies. The previous study measured perceptions of rape, after a rape case that has been intensely covered by the Romanian national media.

We briefly present here the case, as it was reported in a Romanian national newspaper (Voicu, 2014):

'Female student from Vaslui, seized and raped by seven men as she was returning from school.' *'Seven young men from Văleni, with ages between 18 and 27 years old, raped a female student aged 18 years old, after picking her up from the bus station.'*

All data reported in this study were collected one year after the media exposure of the rape case. From all participants that offered responses in the previous investigation (N = 2236), we sent the task to all participants that gave their email address and the explicit consent to be contacted for future studies (N = 668). More specifically, we invited them to respond to a new online questionnaire regarding their opinions and attitudes about rape. In order to test the effect of the number of retrieved cases on rape probability estimation, participants were randomly assigned to one of the three possible conditions: Participants in the first condition were not asked to retrieve any rape case (G0) before rape probability estimation, participants in the second group were asked to retrieve one rape case (G1) and participants in the third group were asked to retrieve three rape cases (G3). Although an equal number of participants were assigned to the three conditions, the number of valid responses received was different, due to the different difficulty of the task in the three conditions (see the Results section).

First, all participants responded to questions regarding demographic and background aspects. A total of 437 participants responded to our study, with the following characteristics: mean age = 33.5, SD = 11.82; 65% women and 35% men. Regarding education level, 1% had completed secondary school, 21% had a high school diploma, 46% held a university degree, and 32% had completed postgraduate studies. A proportion of 8.4% of the

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participants came from rural areas, while 91.6% came from urban areas.

Of those who responded to the invitation to participate, we excluded from analysis participants who did not complete the questionnaire ($N = 5$) and those who did not write the required number of rape cases ($N = 75$).

To control for possible confounding variables, we asked participants additional questions. Specifically, we asked whether they had ever been victims of abuse; 88% answered no, while 12% answered yes. Regarding criminal history, 98.85% had no criminal record, and 1.15% reported a prior conviction. We also asked about criminal law training; 88% had no such training, while 12% did.

We did not exclude any participants who completed the questionnaire in full. However, in our analyses, we examined whether these variables influenced the results. As shown in the results section, these background variables did not affect our findings.

Then, participants in the 'one case' and in the 'three cases' condition received the following instructions: *Please try to remember and write down one (three) real, specific, rape case(s), other than the rape case from Vaslui. It (they) might be a case (cases) that you know about from media, from an acquaintance or from any other source. It is not necessary to provide many details, just write a few keywords about the case (about each of the three cases) (For example: 1 The case of a student from the city X that has been raped by a colleague). It is important to try to remember and to write down the case (all three cases).*

Immediately after writing down the requested number of cases, participants were asked to report the difficulty of retrieval by answering the following question: How difficult was to remember the rape case (*all three rape cases*)? Responses were given on a Likert scale, ranging from 1 to 10, where 1 = *less difficult* and 10 = *very difficult*. Responses to this question constituted the measure of retrieval fluency/difficulty.

Participants from the 'no rape case' condition did not receive neither the instruction regarding the retrieval of rape cases, nor the question regarding retrieval fluency.

Instruments

All participants then received the task to estimate the probability that an 18-year old female student would be raped and to propose a punishment for rape. The specific questions that elicited these responses were:

For probability: What do you think is the probability, in Romania, that an 18 years old female student would be raped? What percent? Please write a number between 0 and 100, where 0 = impossible to be raped and 100 = certainly will be raped'.

For punishment: 'In your opinion, what should be the punishment for rape? a) up to 1 year of prison; b) imprisonment between 1 and 5 years; c) imprisonment between 5 and 10 years; d) imprisonment between 10 and 15 years; e) imprisonment between 15 and 20 years; f) imprisonment between 20 and 25 years; g) life sentence; h) death sentence.'

Finally, participants completed the Cognitive Reflection Test (CRT) that aimed to assess their cognitive style (Frederick, 2005). CRT comprises three items, such as '*A bat and a ball cost \$1.10. The bat costs \$1.00 more than the ball. How much does the ball cost? _ cents*' (the first CRT item). All three items are designed to elicit an automatic answer (in the case of the first item, the automatic answer is 10 cents). However, the automatic answer is

wrong; the correct answer (in this case, 5 cents) can be obtained by engaging in a careful analysis of the problem. In other words, system 1 automatically primes a wrong answer, and the correct answer can be found by engaging system 2. Thus, a high number of correct responses reflects a high disposition to use system 2, that is, an analytic cognitive style. A lower number of correct responses reflects a tendency to rely on responses provided by system 1, that is, an intuitive cognitive style (Frederick, 2005). CRT correlates with other cognitive ability tests (Scholastic Achievement Test, American College Test, The Need for Cognition Scale, The Wonderlic Personnel Test). More importantly, CRT was either the best or second-best predictor of rational decision making based on probability estimation, across all four decision-making domains investigated in the CRT validation study (preference for patient option, expected value favours gamble, expected value favours sure gain, expected value favours sure loss; Frederick, 2005; see Toplak, West, & Stanovich, 2011, for additional data on the validity of CRT). In the present study CRT had acceptable internal consistency, Cronbach's $\alpha = 0.71$.

Results

Rape Probability as a Function of the Number of Retrieved Cases

First, we had to exclude from analyses participants that did not write the required number of rape cases ($N = 75$). As a result, in the 'no rape case' group remained 158 participants, but in the 'one rape case' condition there were 97 participants, while in the 'three rape cases' there were 102 participants (total $N = 357$, mean age = 35.99, $SD = 12.76$, 68.3% women).

Manipulation check: number of cases and retrieval difficulty

The pairwise correlations between all measured variables are presented in Table 1. In order to test whether the number of retrieved rape cases affects retrieval difficulty, we conducted an independent samples t-test, comparing retrieval difficulty experienced by participants in the 'one rape case' (G1) group with that experienced by participants in the 'three rape cases' group. The results showed that participants in the 'one rape case' condition (G1) found retrieval significantly easier ($m = 3.59$, $SD = 2.65$) than those in the 'three rape cases' condition (G3) ($m = 4.78$, $SD = 2.60$), $t(200) = 3.21$, $p < .01$, $d = 0.45$. Thus, as expected, retrieving three rape cases is associated with higher retrieval difficulty than retrieving one rape case.

Number of cases and probability estimates

Next, we tested (1) whether asking participants to retrieve one rape case leads (G1) to higher estimates of rape probability than in the absence of instructions to retrieve rape cases ('no rape case' condition; G0), and (2) whether asking participants to retrieve three cases (G3) leads to lower estimated rape probability, compared to asking them to retrieve one case (G1). In this sense, we submitted the probability estimates to a one-way ANOVA, with number of cases as independent variable. This yielded a significant effect, $F(2, 354) = 5.05$, $p < .01$, $\eta^2p = .028$, which remained significant after controlling for sex, age, cognitive style, history of sexual abuse, law studies, education, and criminal records, $F(2, 345) = 3.70$, $p < .05$, $\eta^2p = .021$. We then proceeded to Sidak post-hoc comparisons, which showed that, contrary to our hypothesis, there were no significant differences between participants in the 'one rape case' condition ($m = 42.41$, $SD = 29.13$) and those in the

‘three rape cases’ condition ($m = 43.78$, $SD = 28.43$), $p > .90$, $d = 0.04$. Also contrary to our hypothesis, participants in the ‘three rape cases’ gave higher probability estimates compared to participants in the ‘no rape case’ condition ($m = 33.72$, $SD = 26.77$), $p < .05$, $d = 0.36$. Finally, participants in the ‘one rape case’ condition gave higher probability estimates than participants in the ‘no rape case’ condition, $p < .05$, $d = 0.31$. In sum, asking participants to retrieve three rape cases did not lead to a decrease in rape probability

estimates. Moreover, both groups of participants that were asked to retrieve rape cases (one or three) gave higher probability estimates than participants that were not requested to remember rape cases (see Figure 1). This shows that making concrete examples available through retrieval increases the risk estimates. However, our attempt to induce retrieval disfluency did not lead to a decrease in risk estimates.

Table 1. Correlation matrix for the measured variables

Variable		1	2	3	4	5	6	7	8	9	10
1. Retrieval difficulty	Pearson Correlation	1	-.125*	-.049	-.098	-.064	-.150*	-.034	.068	-.042	.107
	N	255	249	255	255	254	255	255	255	255	255
2. Rape probability estimation	Pearson Correlation		1	.270**	.142**	.020	.158**	-.104*	.004	-.012	-.259**
	N		400	400	400	398	400	400	400	400	400
3. Rape punishment	Pearson Correlation			1	.032	-.018	.222**	-.029	-.013	-.010	-.210**
	N			406	406	404	406	406	406	406	406
4. History of sexual abuse	Pearson Correlation				1	.039	.246**	-.035	.039	-.043	-.065
	N				406	404	406	406	406	406	406
5. Age	Pearson Correlation					1	-.152**	.126*	-.063	-.023	.012
	N					404	404	404	404	404	404
6. Sex	Pearson Correlation						1	.047	.038	-.055	-.204**
	N						406	406	406	406	406
7. Education	Pearson Correlation							1	.087	-.083	.075
	N							406	406	406	406
8. Law studies	Pearson Correlation								1	-.041	-.015
	N								406	406	406
9. Criminal records	Pearson Correlation									1	-.056
	N									406	406
10. CRT-cognitive style	Pearson Correlation										1
	N										406

* $p < .05$. ** $p < .01$. The Ns for correlations involving retrieval difficulty are smaller because retrieval fluency/difficulty was measured only for participants in the “one case” and “three cases” condition, but not for the “no case” condition. The other Ns differ due to variable amounts of pairwise missing data.

Effect of Retrieval Difficulty on Rape Probability is Moderated by Cognitive Style

For determining whether cognitive style moderates the relationship between retrieval difficulty and estimated rape probability, we ran a moderation analysis using PROCESS macro for SPSS (Model 1), with 5,000 bootstrapped samples (Hayes, 2013). In the analysis were included only participants from the ‘one rape case’ and the ‘three rape cases’ conditions, as only they reported retrieval difficulty. We also included participants from these two conditions that

did not give the requested number of cases, as we were now concerned only about the difficulty of retrieval, not about the specific number of retrieved cases.

The overall model was significant (see Figure 2), $F(3, 268) = 11.82$, $p < .001$, $R^2 = .12$, and the interaction between retrieval difficulty and cognitive style was also significant. More specifically, the analysis revealed that retrieval difficulty was a significant predictor of estimated rape probability only for persons with low analytical thinking levels (and high intuitive thinking levels), but not for

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persons with average scores or with high analytical thinking levels (see Table 2 for the parameters).

Importantly, the same pattern emerged when we controlled for sex, age, history of sexual abuse, law studies, education, and criminal records. That is, the overall model was significant, [$F(9, 259) = 5.39, p < .001, R^2 = .16$], the interaction was significant [$b = 1.28, t(259) = 3.68, p < .01$], and retrieval difficulty was a significant predictor of estimated rape probability only for persons with low analytical thinking scores [$b = -1.98, t(259) = -2.82, p < .01$], but not for persons with average scores [$b = -0.50,$

$t(259) = -0.94, p > .30$] or with high scores [$b = 0.98, t(259) = 1.18, p > .23$]. In sum, our hypothesis (H2), that cognitive style will moderate the relationship between retrieval difficulty and estimated rape probability, was supported by data. More precisely, retrieval difficulty negatively predicted probability estimates only for participants disposed towards the intuitive end of the intuitive-analytic continuum (an intuitive cognitive style). In other words, difficulty of retrieving rape cases leads to lower estimates of rape probability only for participants that have a tendency to rely on the responses given by system 1.

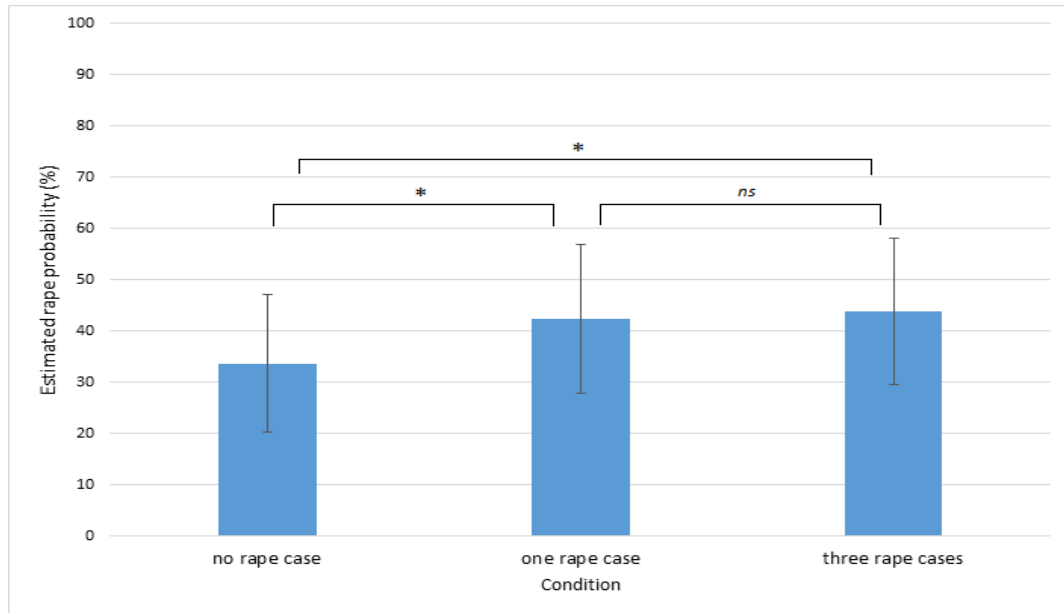


Figure 1. Probability estimated for rape as a function of the number of retrieved cases. Error bars depict standard deviations; * - significant at $p < .05$; ns – non significant

Table 2. The statistical parameters for the moderation analysis

Variable Name	b	t-value	df	p-value
Retrieval Difficulty and Cognitive Style Interaction	1.48	3.13	268	< .01
Retrieval Difficulty for Low Analytical Thinking	-2.06	-2.91	268	< .01
Retrieval Difficulty for Average Analytical Thinking	-0.35	-0.67	268	> .10
Retrieval Difficulty for High Analytical Thinking	1.35	1.69	268	> .05

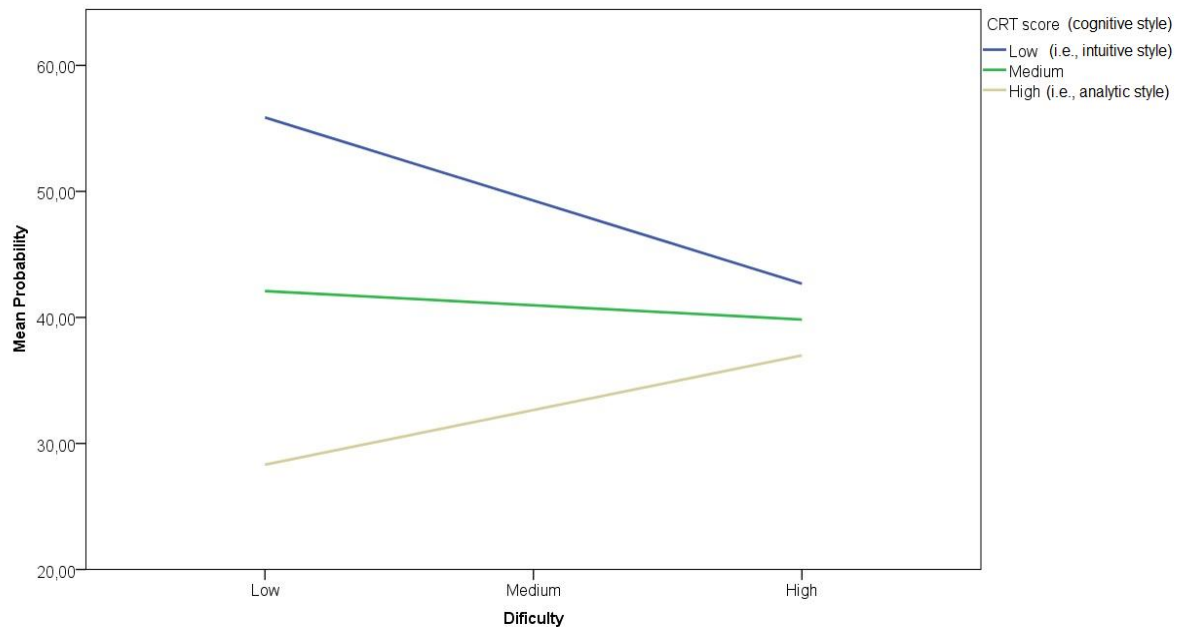
Association between Rape Probability Estimates and Rape Punishment as a Function of Cognitive Style

In order to test whether rape probability estimates and rape punishment are associated stronger in the case of participants with an intuitive cognitive style than in the case of participants with an analytic cognitive style, we computed Spearman correlations for rape punishments and rape probability estimates, but separately for persons with a highly intuitive cognitive style (i.e., persons that obtained

the minimum score at CRT) and for persons with a highly analytic cognitive style (i.e., persons that obtained the maximum score at CRT). Here we used Spearman correlations because the rape punishments variable was an ordinal one. For participants with a highly intuitive cognitive style, the rape probability estimates correlated significantly with rape punishment, $\rho = .29, n = 180, p < .001$; however, for those with an analytic cognitive style, the correlation was weaker and not significant, $\rho = .10, n = 77, p$

> .35. In the second step, we compared the magnitude of these two correlations, using Fisher's r to z transformation (e.g., Myer Sirois, 2006). The comparison indicated a near-significant difference $z = 1.49$, $p = .068$, suggesting that, as expected, rape probability estimates and rape punishment are associated stronger in the presence of an intuitive cognitive style than in the presence of an analytic cognitive style. Thus, as expected, rape probability estimates and rape

punishment are more strongly associated in the presence of an intuitive cognitive style, than in the presence of an analytic cognitive style. This supports the prediction (H3) that probability estimates and proposed punishments are sustained by a common mechanism. This mechanism, attribute substitution, pertains to system 1 and, consequently, manifests more pronouncedly in 'intuitive' than in 'analytic' participants.



Discussion

This study provides four main findings: First, asking participants to retrieve three rape cases is associated with greater retrieval difficulty than asking them to retrieve one rape case, but this increased difficulty does not lead to a decrease in the estimated rape probability. It is possible that the level of retrieval difficulty elicited by retrieving three rape cases was not high enough to be interpreted by participants as a lack of examples. Note that the mean difficulty in the 'three cases' group was still relatively low (mean = 4.78 on a 1 to 10 scale). In a small pilot conducted on students, we observed that people have significant difficulties in retrieving three cases. However, it is very likely that participants from this study had an interest in the topic of rape – as they enrolled voluntarily in a study that investigates attitudes regarding rape – and were aware of more rape cases. Thus, possibly, a higher number of requested cases would have better achieved our objective. A complementary psychological explanation for this result emerges from our second main result: namely, participants that remembered one or three rape cases gave higher probability estimates for rape, compared to participants that did not remember rape cases. It seems, accordingly, that retrieval led to higher estimates than no retrieval. This result shows that once the requested number of cases were retrieved, fluently or difficulty, they might have triggered significant negative emotions. Thus, even if retrieval was difficult, recalling concrete rape cases may trigger relatively intense emotions, which in itself amplifies risk perception. According to the affect heuristic (Slovic et al., 2007), affective intensity can serve as a proxy for estimating probabilities. In conclusion, even when retrieval was

disfluent, participants might have relied on emotional salience rather than on retrieval fluency to guide their judgments.

Third, difficulty of retrieving rape cases was associated with lower rape probability estimates, but only in participants with an intuitive cognitive style. This demonstrates (1) that fluency heuristic impacts risk estimates and (2) that fluency heuristic, as a mechanism found in the repertoire of system 1, exerts this influence in a relatively automatic and non-conscious manner. This supports the idea that the human mind, through the so-called "System 1", uses proxy cues like fluency to generate judgments under uncertainty. In contrast, participants with more analytical styles may rely on deliberative reasoning that integrates more nuance and additional relevant information (e.g., base rates), thus attenuating the influence of availability and affect.

Fourth, we found that risk estimates for rape and punishments proposed for rape are positively associated only in participants with an intuitive cognitive style. We interpret this as evidence for the fact that estimating risks and proposing punishments regarding rape are sustained by a common mechanism, which pertains to system 1. More precisely, in the light of Kahneman and Frederick's (2005) dual system account, the mechanism is attribute substitution, which, in this case, matches risk estimates and proposed punishments with the level of availability of rape cases and with the intensity of the associated negative affect.

In conclusion, this study provides evidence that estimates of rape probability and punishments proposed for

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rape are influenced by fluency heuristic. It also provides evidence that these heuristics result from operations of system 1, and that engaging system 2 reduces their influences. Hence, this study advances the extant literature in three significant ways. First, it tested dual-process mechanisms (fluency, attribute substitution) in a socially relevant and emotionally charged domain (i.e., public perceptions of rape risk), rather than in neutral or laboratory-based contexts. Second, it provides direct evidence that the influence of these heuristics is moderated by individual differences in cognitive style, a factor rarely tested empirically and even less so in applied risk domains. Third, it tested an experimental intervention aimed at modulating risk estimations, which, although unsuccessful, offers potential starting points and directions for further, more effective, developments.

Implications for Dual Process Models

We appreciate that the present investigation provides strong evidence for the validity of the dual process approach - more specifically, for Kahneman and Frederick's (2005) model - and, also, for the ecological relevance of the model.

The finding that fluency heuristic impacts probability estimates only in 'intuitive' participants provides one of the most direct evidence that this heuristic is conducted by system 1. Also, our test of attribute substitution constitutes, to our knowledge, one of the first attempts to verify directly the influences of this theorized mechanism, revealing, consistent with the model, that it is also a result of system 1's workings.

All the hypotheses tested in this study were derived from the dual process model, and received confirmatory evidence in relationship with a real rape case, of which participants have learned in their natural environment. Also, most hypotheses were tested by asking participants to give responses online, not in a laboratory setting. Thus, it seems that the model is able to account successfully for phenomena that occur in daily life contexts.

Implications for Risk Management

Converging evidence from this study show that the evaluations regarding probability of rape and punishment for rape were influenced by processes that have nothing to do with an analytical assessment of the situation (e.g., by fluency, emotion). Also, the results of these processes were inaccurate, as the probabilities of rape were severely overestimated. But can we consider these processes as being irrational, wrong, or dysfunctional? Most likely, no. System 1's main function does not seem to be epistemic accuracy, but rather the fast detection of and, fast responding to, potential dangers. Thus, for events with very low probability but with very high negative consequences, it may actually be necessary for system 1 to 'magnify' their probability, in order to determine the human agent to take appropriate preventive measures (Taleb, 2007, 2014). However, if these measures do become dysfunctional (i.e., they interfere with healthy, adaptive functioning, such as excessive avoidance), system 2 can temper the assessment done by system 1.

Implications for Reducing Dysfunctional Reactions Related to Rape

As fear of rape might be associated with significant emotional and behavioural costs (e.g., pronounced avoidance), we tested a simple technique which intended to decrease probability estimations, that made appeal to the fluency heuristic. However, as we already discussed, this intervention did not work. Nevertheless, the present study

provides other information that can be used in order to reduce the reactions to rape, when, for example, they impair daily functioning. More specifically, the increases in the estimated probability generated by heuristics can be diminished by engaging in analytical thinking: First, participants with analytical cognitive style disposition were not influenced significantly by the fluency heuristic and by attribute substitution. Second, and more importantly, there was a general negative correlation between the CRT score and probability estimates ($r = -.26, p < .001$). In other words, the higher was the disposition to think analytically, the lower was the estimated probability for rape. This shows that the overestimation of rape risk (which can generate maladaptive avoidance reactions) can be adjusted by engaging System 2. We used the CRT scores to categorize participants as primarily relying on either the intuitive or the analytical system. However, a preference for intuitive processing is only a tendency and does not preclude the use of analytical reasoning. Thus, by engaging the analytical system deliberately and with conscious effort, we can adjust the responses automatically generated by the intuitive system. A rational analysis of risk - similar to cognitive restructuring in therapy (e.g., Beck, 2011) - can therefore reduce the estimated risk of rape and mitigate the negative consequences of such overestimation.

Implications for judicial practice and for the forensic field

We appreciate that the present study provide insights in the cognitive mechanisms through which the exposure in the media of a real rape case shapes the public's attitudes towards rape. The insights have implications for the cognitive models of judgements related to risk, more specifically related to criminal behaviour. At a practical level, the findings might impact especially how the public opinion is taken into account when courts decide on preventive measures or on verdicts. We have shown that public reaction is used as a criterion for assessing public danger, which, in turn, is considered in criminal decisions. An accused person can be preventively detained, and a convicted person may receive harsher punishment as a result of the public's reaction to the crime. This public reaction is often shaped by the mass media. Through the press, extensive information about a case can be circulated, or entire media campaigns may repeat the same information. This creates the conditions for the availability heuristic to emerge. Furthermore, the same news can be presented in ways that intensify the emotional impact, often intentionally, to make the content more appealing. This creates the conditions for the affect heuristic to operate: the media engages with the audience's emotions, manipulating public opinion through sensationalism. Understanding these two effects and their role in shaping public reaction allows for a more accurate evaluation of the extent to which such reactions should influence decisions that restrict an individual's liberty.

Furthermore, given the supposed universality in our species of the mechanisms composing System 1, jurors, judges, or prosecutors could also be susceptible to non-analytical influences. That is, if availability and affect heuristics influence lay judgments about rape, similar processes may influence legal decision-making, potentially leading to disproportionate punishment proposals or preventive detention measures in cases that are intensely mediatized or framed in an emotionally-loaded manner. Awareness of how these mechanisms operate and predispose to biases may inform legal procedures and

protocols, in order to encourage analytical decision-making in courtrooms and prevent potential irrational influences.

Limitations and future directions

One of the limitations of our study regards the high drop-out rate in the one rape case and three rape cases conditions; consequently, the effects of our experimental manipulations might have been underestimated, since participants that found the retrieval of cases very difficult, did not submit their responses. Another limitation is that we did not measure directly the emotional impact of the retrieved cases, thus our inferences regarding the involvement of the affect heuristic are indirect. Please note that introducing a measurement of emotion after each retrieved case would have interfered even more with the manipulation of retrieval fluency. Another constraint on our results is given by the nature of our sample: specifically, many participants had some level of interest related to rape cases, since they voluntarily enrolled in a previous study related to rape and also chose to respond to this second study on the topic. Future studies should try to investigate the present hypotheses in a sample more representative for the general population. Also, future studies should attempt to measure whether the estimated risks regarding one's own victimization would be more strongly related to the proposed punishment for rape. At a more general level, we believe that research should attempt to further disentangle the mechanisms involved in the perception of criminal risks, since these perceptions often influence individual responses related to criminal activities and, also, criminal policies.

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