ABSTRACT

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A general model is introduced to account for the multiple findings from different lines of research related to the phenomena of motivated biases. Parameters and specific implications of the model are discussed with brief review of relevant empirical research. Of main focus of this paper is the parameter "residual cognitive resources". It is hypothesized that since biases can be difficult thus resource demanding, when residual cognitive resources are scares rather than ample there should be less bias. It is also hypothesized that residual resources should interact with the relative magnitude of the focal accuracy judgment goal versus directional background goal to determine the extent of motivated biases. Two current studies supporting these hypotheses are presented.

MOTIVATED BIAS AS PERCEIVED MEANS INSTRUMENTALITY

By

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Chapter 1: Introduction of the General Model

The research on motivated biases in judgment underwent several transformations. The first issue was whether such biases were even real, as opposite to the possibility that the effects obtained revealed the workings of cognitive mechanisms like expectancy (Bem, 1972; Ross & Fletcher, 1985; Tetlock & Levi, 1982). Work by Kunda (1990), Kunda and Sinclair (1999), and Dunning (1999) concluded however, that after all is said and done motivational biases are real (for discussion, see Kruglanski, 1996). The next phase of the research on motivated biases concerned itself with the question of the boundary conditions, representing the second logical phase in the evolution of a research program (Zanna, Fazio, 1982).

We seem to accept clear cut negative news (e.g., speed tickets, failed exams, rejection of grad school applications, etc.) simply as a reality rather than readily misperceiving or reinterpreting them in motivationally desirable terms. Thus, a major boundary condition of motivated bias has to do with the "reality constraints" exercised by the informational environment confronting the individual (Kunda, 1990). Clarity of the information afforded to the perceiver defines such a constraint. The clearer the information, the more difficult it may be to distort it despite one's motivation. Opposite to Kunda's (1990) notion of "reality constraints" is Hsee's (1996) idea of "elasticity", denoting a low level of information clarity. According to Hsee, "elasticity in justifiable factors" refers to "the possibility of interpreting those factors in multiple ways…where different justifiable factors have different values and the relative weights among those factors are ambiguous so that one can interpret the aggregate effect of those factors in multiple ways." (Hsee, 1996, p. 124).

In his elasticity studies, Hsee (1996) predicted and found that when the information given is "elastic" (one choice option is better than another on some features and worse on other features) individuals distort their evaluation of the elastic "justifiable" factors (e.g., competitors' relative standings, job candidates' relative competence, houses' relative conditions), in the direction of the motivational, "unjustifiable" factor (e.g. the nationality of the pianist, the looks of the job candidates, hypothetical fiancé involvement as a buyer) and then make judgments that appear to be based solely on the justifiable factors but is in effect are influenced by the unjustifiable factors.

Information clarity, thus, appears to constitute one obstacle on road to motivated bias. However, it is possible that with sufficient motivational magnitudes even information with relatively clear "objective" implications (as they might appear to outside observers) might be distorted as illustrated, e.g., by the occasional denials by widows and widowers of the death of their spouses (Stroebe, Hansson, Stroebe, & Schut, 2001), or the denials of terminally ill patients of their own impending death (Kübler-Ross, 1969).

Whereas the idea of clarity and elasticity is important, it is somewhat specific and limited. Moreover, it does not afford a general perspective on the phenomena of motivated bias, or a view of the overarching parameters determining the conditions under which motivated bias is more or less likely to take place. In what follows I attempt to adumbrate such a general perspective.

Bias in perceived instrumentality: common underlying mechanism

In the process of making a judgment accuracy is the general focal goal, of which individuals are generally aware. By definition, making a judgment (rather than a mere guess) is believing it to be accurate. Beside this focal goal of accuracy there might be present different directional background goal(s), either with or without the individual's awareness, such as ego enhancement or self esteem goals accorded considerable attention in the literature (e.g. see Kunda, 1990). According to Kruglanski et al's (2002) multifinality principles, when multiple goals are present the means serving such multiple goals simultaneously is preferred over unifinal means that serve only the single focal goal. Therefore, when the accuracy judgment goal and directional background goal are present at the same time the means that could potentially serve both goals should be preferred. In the interest of mulfitinality, bias in judgment in favor of the background goal can happen through the bias of perceived instrumentality of the means for the focal goal. In other words, if a given judgment is deemed instrumental to the background goal, say of ego enhancement, it might be perceived as accurate, that is, as instrumental to the focal goal as well, even though in the absence of the background goal it might not be perceived as accurate.

The foregoing process of judgmental bias may be moderated by several variables. The key moderators of the extent of bias are listed below, as parameters of a comprehensive model to be described in what follows:

- Relative magnitude of the focal goal vs. that of the background goal
- Potential instrumentality of a means (a given judgment) for the focal goal vs. its instrumentality for the background goal
- Residual cognitive resources available for bias

- Bias difficulty

The general formula describing this underlying mechanism is given bellow.

A general model for motivated bias:

Equation (1)[1]:

Bias extent (IFG)= [(M$_{BG}$*I$_{BG}$)/M$_{FG}$]*[Residual resources/Bias difficulty]

In this formula bias is defined as the bias in judgment in the direction of some desired background goal. The extent of bias in terms of the perceived instrumentality of a specific means to the focal goal, is assumed to be positively related to the magnitude of the background goal and the instrumentality of that specific means to the background goal, and negatively related to the magnitude of the focal goal, Furthermore, the extent of bias is assumed to be positively related to the residual cognitive resources (that bias may require), and to be negatively related to bias difficulty.

Major implications:

In the following sections I will review some key implications of the present general model of motivated bias and discuss some empirical evidence for each of those implications.

Implication 1: Other factors being constant, the higher the means instrumentality for the background goal, the greater the bias in terms of the tendency to perceive the judgment favoring the background goal as accurate, that is, instrumental for the focal goal.

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[1] In the formula, "FG" stands for Focal Goal (of making an accurate judgment); "BG" for directional Background Goal (preference for a particular conclusion); "M" for goal Magnitude; "I" for means Instrumentality; "I$_{BG}$" for the degree to which the distorted judgment is perceived to serve the background goal; "I$_{FG}$" for the degree to which the distorted judgment serves the goal of accuracy (FG).

Suggestive evidence in support of this implication is provided by the "position effect" demonstrated in Nisbett and Wilson's studies (1977). In their studies passersby at a department store chose among four different nightgowns of a similar quality, or among four identical pairs of nylon stockings, and they found that the two rightmost objects in the array were heavily over chosen. This strong position effect could be explained by the principle of multifinality (Kruglanski et al, 2002). In Nisbett and Wilson's studies (1977) participants may have had two goals in mind, (1) the focal goal: making a reasonable and accurate choice, (2) the "background" goal (presumably out of their awareness): reaching quick closure after inspecting the entire stimulus array. According to the principle of multifinality the right most two objects served both the focal goal and the background goal thus were highly chosen.

This explanation was tested and supported by a series of unconscious choice studies done by Kruglanski and his colleagues (Chun, Kruglanski, Sleeth-Keppler & Friedman, 2004). Their studies constructively replicated Nisbett and Wilson's 1977 studies and changed (in Study 1) the relative magnitude of the accuracy goal (focal goal) versus the goal of reaching quick decision (the presumed background goal). It was found that introducing the background goal of closure produced the position effect while enhancing the focal goal of accuracy/accountability reduced this effect. Pertinent to our general motivated bias model, the foregoing findings are consistent with the multifinality principle and its role in the process of "bias." Specifically, in this case the preference for the multifinal means (reflected in judging the rightmost two objects as of the highest quality) seems to reflect the bias in the perception of instrumentality for the accuracy focal goal that fulfills the background goal of closure

as function of its magnitude (reflected in the comparison between the time pressure and the accountability conditions).

Similar supporting evidence is provided by Chun et al.'s unconscious choice studies (studies 2, 3, and 4, 2004) with manipulations of different directional background goals. The choice items in all these studies were equally instrumental with respect to the participants' accuracy focal goal and the specific choices were made because of their high instrumentality to the background goal. These findings also pertain to the factor of relative goal magnitude in Equation (1).

Implication 2: Extreme case-Unifinality: Where the instrumentality of one means (a particular judgment) to the focal goal is distinctly higher than that of the other means (other judgment) while the instrumentality of the same means for the background goal is distinctly lower that that of the other means, the choice between means is determined by the difference in magnitude between focal goal and background goal. The goal with higher magnitude overrides that with the lower magnitude.

This prediction was supported by "focal override" effect found in Chun et al.'s unconscious choice study 3 (Chun, Kruglanski, Sleeth-Keppler & Friedman, 2004). In this study participants were told to taste three soda drinks and pick the best quality one. The manipulated background goal was to identify or dis-identify with the American culture. The control drink "Shoppers Cola" was chosen as "tastiest" when its quality actually was superior to the alternatives ("Coke" versus "Pepsi" that were shown in a pilot study to serve the background goal of either identifying or dis-identifying with America respectively) irrespective of the background goal. "When

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participants' focal goal clashed with their background objectives, the latter were quickly sacrificed allowing the consciously pursued objective to prevail" (Chun, Kruglanski, Sleeth-Keppler & Friedman, 2004). However, in the "inferior" condition where "Shopper's Cola" was poorer tasting than Coke or Pepsi (that tasted the same), the choice between the latter two options was driven by the background goal, of identification or dis-identification with America. Specifically, Coke was preponderantly chosen in the identification condition, and Pepsi in the dis-identification condition.

But is the "focal override" effect found by Chun et al. (2004) to be expected generally, or only under specific conditions? What if the background goal were of a much higher magnitude for the individual than the focal goal? According to the present "bias" formula (see Equation 1), the bigger "M_{BG}/M_{FG}" term would probably still enable the "bias".

To address this issue (Kim, Kruglanski & Mitchell, 2006) carried out a study in which participants were instructed to choose the better tasting drink between two different versions of ice. The goal of "being healthy" was primed in the experimental condition. Between the two choices, the sample that contained pure iced tea was labeled as "*Dailytea*, iced tea that makes everyday life smooth" whereas the sample composed of diluted iced tea was labeled as "*Nutratea*, iced tea packed with nutrients."

Consistent with their predictions, Kim et al. (2006) found that when participants were just given the focal goal to choose the best tasting drink, the majority chose the alternative that contained the pure ice tea. However, when the

background goal of being healthy was induced, participants showed a reversed choice pattern and chose the alternative drink that was diluted with water, despite the focal goal of choosing the better tasting drink. Contrary to their difference in behavior, participants in both the experimental and control conditions reported that their choice was based on taste (e.g., milder taste, smoother texture). In other words, participants believed their reports to be accurate, suggesting that the choice of the diluted drink was multifinal with respect to the focal accuracy goal and the background goal (of health).

The next two implications from the present motivated bias model pertain particularly to the second part of the formula in Equation (1): We are assuming that bias could be difficult and require considerable "cognitive work" (Festinger, 1957). If that is so, bias could be resource demanding. Indirect evidence that processing "ease" facilitates motivational bias comes from a number of sources. Festinger (1957), for example, argued that the attitude change occasioned by cognitive dissonance would take place because it is an easier avenue of restoring consonance than is altering one's cognition about the dissonant behavior. In this sense, the voluminous research consistent with dissonance theory could be viewed as indirect evidence for the assumption that bias difficulty matters, and that the easier way toward bias would often be preferred over the more difficult way. Somewhat in the same vein, Wood, Kallgren, and Preisler (1985) found that participants with greater access to attitude-relevant information in memory, that is, participants for whom it should have been easier to generate motivationally-congruent construals, generated more negative thoughts, and were less persuaded by counter-attitudinal, hence motivationally

undesirable, messages than were less knowledgeable participants. These notions can be summarized in the following formal implication.

Implication 3: Other factors being constant, the higher the difficulty in bias the less should be the extent of bias. Why should bias be difficult and resource demanding? The answer may reside in several possible underlying mechanisms that may enable bias: (1) Suppression/inhibition of undesirable or motivation inconsistent information. (2) Denial of obvious "reality" features (Kunda, 1990) (3) Generation of counterarguments to undesirable information involving a possibly laborious memory search or an effortful construction of new, motivationally desirable counterarguments. One relevant notion in this context is Freud's (1920) influential concept of defense mechanisms. According to Freud, the unconscious Id is the source of all of a person's motivational forces, emanating from instinctual demands and drives that demand immediate satisfaction. To deal with such demands and the attendant anxiety from conflict between the Id and the Ego the Ego changes the Id's raw instinctual impulses to more socially admissible forms that govern acceptable behavior. One typical form of defense mechanisms is "repression", paralleling our first proposed underlying mechanism of bias, namely suppression/inhibition of undesirable or motivationally inconsistent information. For example, a person might be unable to recall a threatening situation or completely forget that an abusive person ever was a part of his/her life. Another form of defense mechanism according to Freud is "denial", paralleling the same mechanism postulated by our bias hypothesis. An extreme case of denial would be a widow's denial of her husband's death by refusing to "accept it" (Stroebe, Hansson, Stroebe & Schut, 2001; Hansson & Stroebe, 2007). It is plausible

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that such denial requires much energy as realities are hard to distort (cf. Kunda's (1990) notion of "reality constraints.")

A yet different defense mechanism in Freud's theory is "rationalization". This defense simply involves making excuses for a potentially unacceptable behavior or for an unacceptable emotion. If a woman has been rejected by a man she fancied, she can rationalize that he is "no good, anyway" by bringing to mind all kinds of "evidence" (what in popular language is referred to as the "sour grapes" phenomenon). This defense mechanism corresponds to our third proposed mechanism of bias: generation of counterarguments against undesirable information and/or construction of novel framings congruent with the directional motivation.

In her 1990 paper, Kunda's (1990) extensive review of evidence for motivational biases in judgment identified two mechanisms potentially mediating such biass. These mechanisms are highly consistent with the present analysis. Specifically, according to Kunda, to "justify" a desired particular conclusion, people may search their memory for those beliefs and rules that could support their desired conclusion and they may also creatively combine accessed knowledge to construct new beliefs that could logically support the desired conclusion. It seems plausible to assume that the difficulty of bias should depend on how hard such memory search and/or the construction of new framings of the information given are. If concepts (such as counterarguments) congruent with the desired conclusion are highly accessible in memory bias should be relatively easy compared to a case wherein such concepts are less accessible or even unavailable.

Hence, if such mechanisms of bias do exist, and if their utilization may involve a certain degree of difficulty, the effectuation of bias should require overcoming the difficulty involved, for which one would need sufficient cognitive resources. To put it more precisely, the ability to effectuate bias should depend on the relation between bias difficulty and residual resources available for bias process. Where bias difficulty is considerable relative to residual resources the likelihood of motivational biass will be lower than where bias difficulty is low relative to residual resources. This idea is tested in the present studies.

Implication 4: We are assuming that bias process is resource demanding, thus with everything else constant, the less residual resources left for bias the less the extent of bias. Cognitive resources may be depleted by current information processing demands, or by engagement in a previous cognitive task to the extent that such task was demanding and laborious (Baumeister et al, 1998), or by low points of one's circadian circle, etc. The current paper focuses on one source of resource depletion: current information process demands. Two studies were carried out to test the effect of this source of depletion on the extent of motivated bias.

Chapter 2: The Present Studies

The present studies constitute one portion of a larger program of research designed to test the validity of the overall model of motivated bias described earlier (see Equation 1). Previous has not systematically manipulated the presence of residual resources available for bias. A careful examination of previous experimental procedures suggests that they were generally low in information processing demands and that participants in these studies had ample cognitive resources available for bias.

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Hypothesis: Our main interest in the present studies is to investigate the possibility that imposing considerable cognitive demands on the information processing task will deplete individuals' resources available for bias, and hence reduce the extent of motivationally congruent bias. Therefore, our specific hypothesis was that the more demanding the information processing task, the less the motivated bias.

Study 1:

Information complexity/length and simultaneous cognitive load (as two independent operationalizations of the same conceptual variable: information processing difficulty) together with a directional motivation to distort, were manipulated in this study. It was predicted that the more difficult the information processing task, the less the bias of judgment in a motivationally congruent direction.

Our hypothesis was tested in an achievement goals paradigm where two classes of goals have been identified – performance goals aimed to validate one's ability or avoid demonstrating a lack of ability, and learning goals, whose aim is to acquire new knowledge or skills (i.e., to increase one's ability). Ample evidence exists that the adoption of the achievement goals can determine achievement patterns and most important for purposes of our study, the patterns of failure attribution (see Ames, 1992; Ames & Archer, 1988; Butler, 1987, 1993; Dweck & Elliot, 1983; Dweck & Leggett, 1988; Elliott & Dweck, 1988; Harackiewicz, Barron, Carter, Lehto, & Elliot, 1997; Kaplan & Maehr, 1999; Middleton & Midgely, 1997; Nicholls 1984; Pintrich, 2000a; Rawsthorne & Elliot, 1999; Utman, 1997; Mueller & dweck, 1998).

Specifically, learning goals have been found to predict effort-based attribution for failure (affirmative answer to an item: "I think that if I work harder, I can do better."), whereas performance goals, in contrast, have been found to predict ability-based attribution (affirmative answer to an item: "I feel like I'm just not good at this subject"). Since We assume that loss of self-worth or a threat to self-esteem is associated with a negative ability attribution, performance goals should presumably be positively correlated with loss of self-worth thus a motivation to restore impaired self-esteem whereas learning goals presumably wouldn't induce this directional motivation in the face of failure.

People's chronic achievement goal orientation can be assessed by different scales such as Button, Mathieu, & Zajac's Learning and Performance Orientation Scales (1996); Elliot & Church's Achievement Goal Scale (1997); and Grant-Pillow & Dweck's achievement goal items (2003). It was also demonstrated (Grant-Pillow & Dweck, 2003) that performance and learning goals may be induced situationally.

Specifically, Grant-Pillow and Dweck (2003) successfully used instructions presented to participants prior to their engagement in an achievement task to situationally induce a learning goal versus a performance goal. In the present study a modified version of performance goal induction was used across the board to situationally enhance the performance goal for all participants. It was assumed that task instructions emphasizing performance and assessment of ability along with the mention of grades and normative rank would enhance a performance goal relative to a learning goal and induce the tendency to make negative ability attributions for failure simultaneously engendering the directional motivation to restore the impaired self-

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esteem. The latter motivation was assumed to represent a biased background goal in the later scheme choice task that participants were asked to perform.

Study design

This study employed a 2 (high vs. low information complexity/length) x 2 (presence vs. absence of simultaneous cognitive load) factorial design. The first independent variable, information complexity, was manipulated by two versions (Appendix A and B) of a fictitious "research report" (explained in study procedure section) presented to participants, one was simple and short and the other complex and long. The second independent variable, cognitive load, was manipulated by a concomitant rehearsal of an 8-digit number. The dependent variable bias was operationalized by the derogation of an ability test. It was assumed that when participants with a performance goal failed an ability test they would be motivated (often without their own awareness of it being so) to restore their impaired self-esteem by derogating the validity of the test. It was also assumed that the extent of such bias would be moderated by information processing difficulty operationalized by information complexity/length, and similarly by cognitive load.

Thus we predicted two main effects due to information complexity/length and cognitive load. Specifically, participants were assumed to demonstrate less bias when the information was complex/long versus simple. The extent of bias should be similarly reduced by simultaneous cognitive load.

Method

Participants:

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120 UMD undergrad students were recruited for a study on "Information Processing and Judgment Making". One extra credit was offered for the completion of this study. Data collection lasted from the fall semester of 2004 to the spring semester of 2005. The subjects were mainly from introductory level psychology classes at the University of Maryland, College Park.

Procedure:

The entire experimental procedure was carried out on desk top computers. Participants were led to believe that the aim of the study was to "*evaluate the validity of the analytical reasoning test in typical exams for entering graduate school including GRE, GMAT, and LSAT*." Participants were also told that in order to do so they would need to take a sample analytical reasoning test to get an idea of what this kind of tests were like. Finally, participants were advised that in order to allow them to make a more informed judgment, they would be given a report of a research project conducted by GRE board examining the validity of the GRE analytical reasoning test that they would perform. The fictitious research report was intended to manipulate information complexity and length by two versions of the report, one was simple and short and the other was complex and long. Furthermore, cognitive load was manipulated by asking participants to simultaneously rehearse an 8-digit number while they were reading the report.

The following instruction was given to situationally enhance participants' performance goal (Grant-Pillow & Dweck, 2003) at the beginning of the lab session:

 "*…first you need to take a **mini Analytical Reasoning Test** (that contains ten questions taken from the actual previous GRE and GMAT exams)…by taking this*

mini test we hope you can get some idea of what the real test is like and what kind of abilities it is supposed to examine. Also you can probably get to know how good you are at this intellectual dimension -- for your reference you will get instant feedback from the computer program afterwards, including an absolute score and percentile compared to general Maryland students."

Ten difficult questions were selected from previous GRE analytical reasoning tests for the purpose of this study. These questions were rated as high in difficulty in Kaplan study manual for preparing for GRE. The difficult questions were chosen so that participants would not be certain about the correctness of their answers minimizing possible suspicion when we gave them negative feedback for the test.

All participants received the same instant negative feedback (pre-programmed on computer) immediately following the completion of the test. Specifically, on the computer screen they saw that their score was 40 out of a 100 and that their percentage rank was 30%) compared to Maryland students as a whole.

The subsequent "research report on the validity of GRE analytical reasoning test" was made brief and easy to understand under *low information complexity/length* conditions while it was made long and complex under *high information complexity/length* conditions. The two versions of the report were given to 16 students in a pilot study to make sure they did not differ in their clarity of information and that the complex version of the report did not make it appear more or less valid as compared to the simple one. Results from this pilot study showed that students given either version of the report rated the validity of the analytical reasoning test at the same moderate level. Participants under cognitive load were instructed to rehearse an

8-digit number while they read the "research report" whereas participants in the no load conditions were not asked to do so. All participants then responded to questions assumed to tap the dependent variables of this research.

The main dependent variable, extent of bias --- was operationalized by the degree to which participants derogated the test they just performed and was measured by participants' responses to two questions: "*To what extent do you feel the test you just took examined your overall analytical abilities?*" and "*To what extent do you think the Analytical Reasoning test is valid in examining test takers' analytical abilities?*", each on a 7-point Likert scale with low scores indicating high levels of bias. Following their completion of these items participants were thoroughly debriefed and thanked. This concluded the experiment.

Results

Manipulation check: Efficacy of our manipulation of information complexity/length (as one poerationalization of information processing difficulty) was tapped by the question "*How difficult to understand do you think was the article you just read?*" Answers to this item were recorded on a 7-point Likert scale with low scores indicating high information processing difficulty. The difference in the responses between low ($M = 4.55$, $SD = 1.43$) versus high information complexity/length ($M = 3.67$, $SD = 1.23$) conditions was significant, $t(118) = -3.625$, $p < .001$, indicating that subjects in the *high in formation complexity/length* conditions perceived the information as more difficult to process compared to those in *low information complexity/length* conditions.

Bias Extent: Results from ANOVA showed no significant main effects. However, the cells with simple information and no cognitive load showed significantly greater bias than any of the other cells. It is possible that ceiling effect occurred such that either the cognitive load or the information complexity alone sufficed to disable the occurrence of bias.

Simple effect analyses using t tests on both DV questions showed the same pattern of bias. Specifically, when asked whether the test examined own ability, subjects who were given the simple information rated the test as significantly less valid under no-load ($M = 2.67$, $SD = .99$) versus under load ($M = 3.27$, $SD = 1.14$), $t(58) = 2.170$, $p = .034$. Similarly, when asked whether the test examined the ability in general, subjects in low information complexity/length conditions showed significantly more bias under no-load ($M = 2.93$, $SD = .83$) compared to those under load ($M = 3.50$, $SD = 1.04$), $t(58) = 2.332$, $p = .023$. Information complexity manipulation generated similar effect on the extent of bias, as reflected by answers to both questions. In the absence of load, participants who received simple and short information derogated the test to a greater extent ($M1 = 2.67$, $SD = .99$; $M2 = 2.93$, $SD = .83$) than participants who received complex and long information ($M1 = 3.23$, $SD = 1.19$; $M2 = 3.37$, $SD = 1.10$), $t(58) = 1.997$, $p = .050$ for question 1, and $t(58) = 1.726$, $p = .090$ for question 2.

As the ratings for the two questions were highly correlated ($r12 = .636$, $p < .001$), I combined them to created a single index of bias (Figure 1). T test carried out on this index showed that under low information complexity/length bias was significantly higher under no-load ($M = 2.80$, $SD = .82$) versus load conditions ($M =$

3.38, $SD = .94$), $t(58) = 2.561$, $p = .013$; and that when there was no load, bias was significantly higher under low ($M = 2.80$, $SD = .82$) versus high information complexity/length conditions ($M = 3.30$, $SD = 1.06$), $t(58) = 2.043$, $p = .046$. These results are consistent with our hypothesis. The similar effect of information complexity and cognitive load is encouraging given that they were meant to constitute two independent operationalizations of the same conceptual variable: a lack of cognitive resources due to high information processing difficulty.

Discussion: Study 1 investigated a situation wherein cognitive resources were depleted either by the high information complexity/length or by cognitive load. When a directional background goal of restoring impaired self-esteem was induced in all participants, those who were given simple/short (vs. complex/long) information and those not exposed to load (vs. those exposed to load) demonstrated a greater extent of bias in their judgment of test validity and degraded the test more.

Study 1 thus provides supporting evidence for the hypothesis that relates the presence of residual resources to the extent of bias: bias requires cognitive resources, thus a lack of residual cognitive resources due to various reasons (in the present case information complexity/length or simultaneous cognitive load) reduces the amount of bias.

While the present study demonstrates the parallel effects of two sources of information processing difficulty as one cause of resource depletion, namely, information complexity/length and simultaneous cognitive load, on the extent of motivated bias, it is also of interest to see how residual resources may interact with relative magnitudes of the accuracy focal goal versus the directional back ground

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goal. It is hypothesized that when the magnitude of directional goal is high relative to the focal accuracy goal bias will occur and it will occur to a greater degree when the residual resources are ample rather than scarce. A second study was conducted to examine this hypothesis.

Study 2:

Study design

Study 2 primed the directional background goal of identifying with the University of Maryland in the experimental condition while enhanced the focal accuracy goal in the control condition. Residual resources were manipulated by information processing demands. Thus study 2 employed a 2 (relative magnitude of accuracy goal versus directional background goal) x 2 (high versus low information processing demands) factorial design. An interaction effect between the two independent variables was expected. Specifically, it was predicted that participants with the goal to identify with University of Maryland, but not those in the accuracy goal control conditions, distort their judgment in the direction of favoring the university when the information was easy (vs. difficult) to process (leaving ample residual resources for bias).

Method

Participants:

130 UMD undergrad students were recruited for a study on "Cognition and Social Judgment". One extra credit was offered for the completion of this study. Data was collected in the Fall semester of 2006. Participants were mainly students from introductory level psychology classes at the University of Maryland, College Park.

Procedure:

Participants first engaged in a lexical decision task during which they were subliminally primed with either words relating to the University of Maryland (e.g., terps, terrapins, etc.), or with accuracy related words (e.g., accurate, correct, etc.). It was expected that the Maryland primes would activate their UMD identity and thus the directional motivation to favor the own university in the following task, whereas the accuracy related words would enhance the focal goal of accuracy.

At this point, participants were given the following information "The Atlantic Coastal Conference (ACC, a fictitious organization), is testing procedures for granting an award to one university each year for overall track and field achievements. Below is information about the University of Maryland and Duke University. The scores reflect performance across many different track and field events, and the ACC would like to come up with a way to rate the overall performance."

Participants were then presented with the track and field performance of each university. This was presented either in an easy to read table (Table 1), or in more difficult to process sentences, as follows:

"*In the relay race, Maryland finished in 6th place and Duke finished in 3rd. In the discus, Maryland finished in 1st and Duke finished in 6th. In the sprint Maryland finished in 5th and Duke finished in 2nd. In the hurdles Maryland finished in 3rd and Duke finished in 3rd. In the decathlon, Maryland finished in 5th and Duke finished in 3rd. In the javelin, Maryland finished in 3rd and Duke finished in 5th.*"

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It was assumed that the information presented in the easy table format was low in processing demand thus leaving ample residual resources for bias, compared to the same information presented in the more difficult paragraph format.

Finally, participants were asked four questions tapping the extent to which they thought Maryland or Duke was more deserving of the award. Specifically, these questions were: (1) Maryland should win the award over Duke. (2) Maryland outperformed Duke. (3) Duke should win the award over Maryland (reverse). (4) Duke outperformed Maryland (reverse). Answers were recorded on 9 point Likert scales anchored at the ends with "Disagree very strongly" for 1 and "Agree very strongly" for 9.

This concluded the experiment. Participants were thoroughly debriefed and thanked for their participation.

Results

Manipulation check: A significant main effect of information processing demand (F (1.128) = 5.526, p = .02) from ANOVA looking at the responses to the single item "*It was difficult to read the information*" showed significant difference between the high (M = 5.93, SD = .24) versus low (M = 5.13, SD = .24) information processing demand conditions.

Judgment of award designation: Results from ANOVA using the average of the responses to the four DV questions revealed a significant two way interaction between motivation and residual resources, supporting our prediction, $F(1, 128)$ = 7.33, p = .008 (Figure 2). Specifically, participants primed with the Maryland identity distorted the information in the direction of UMD winning the award when the

information was easy to process. However, when the information was difficult to process, participants did not distort the information.

Results of t tests for simple effect analyses showed that when the information was easy to read (i.e., in a table format), participants primed with Maryland related stimuli responded in a way that was more biased towards Maryland winning the award (M = 5.0, SD = 1.82) than participants primed with accuracy related words (M = 4.1, SD = 1.75), $t(63)$ = 2.13, p = .037. In the difficult condition, however, there was no difference between participants primed with Maryland stimuli (M = 4.1, SD = 1.34) and participants primed with accuracy stimuli (M = 4.8, SD = 1.85), $t(65)$ = 1.68, p = .098.

Moreover, when participants were primed with Maryland stimuli, those in the easy condition were significantly more biased towards Maryland winning the award (M = 5.0, SD = 1.82) than did their counterparts in the difficult condition (M = 4.1, SD = 1.34), $t(62)$ = 2.33, p = .023. Finally, when participants were primed with the accuracy stimuli, there was no difference between participants in the easy condition (M = 4.1, SD = 1.75) and the difficult condition (M = 4.8, SD = 1.85), $t(66)$ = 1.55, p = .125.

Discussion: Study 2 examined the interaction effect of the relative magnitude of the two motivations involved in bias phenomena with the residual resources available for bias manipulated by information processing demands. Its results provide support for the hypothesis that motivationally congruent bias is more likely to occur when the magnitude of directional background motivation is high relative to the accuracy focal goal bias, given that the information is relatively easy to process.

As discussed earlier, lack of residual resources available for bias can be due to different causes. Future studies could test the effect of this moderator, by itself or in interaction with other model parameters, using different operationalizations such as a preceding fatiguing cognitive task or high versus low points of ones' circadian circle to mention just two examples.

Chapter 3: Summary

The general model proposed here to account for the process of motivated bias helps to integrate phenomena in diverse lines of research related to motivational biases in judgment. The specific parameters in the model help to understand the underlying mechanisms of such phenomena. This model affords the explanation of multiple prior findings in the motivated social cognition literature and it carries further implications some of which were investigated in the two experiments contained in the present report. These studies pertain to a parameter that has not received explicit attention in the motivated social cognition literature so far, namely residual cognitive resources. Their results are consistent with the present model, and offer initial evidence for the role of available resources in the motivational biases in human judgment. The phenomena of motivated bias are ubiquitous in human affairs. Sometimes bias in judgment could be functional and beneficial, for example Taylor and Brown have argued that positive illusions are adaptive as they increase motivation and persistence (Taylor & Brown, 1988), whereas in other circumstances bias it could be counterproductive if not dangerous (Weinstein, 2004). Imagine a patient distorting or denying his/her problematic health situation such as playing down the seriousness of early symptoms of a severe disease. Such person may avoid

or refuse to undergo the necessary medical procedures, hence allowing the conditions to deteriorate.

Alternatively, individuals who distort an abusive relationship and judge it as normal might end up as long-term victims. Thus fully understanding the underlying mechanisms of such motivated biass is quite important in a variety of cases, and rich in implications concerning ways of coping with life's adversities and failures.

List of tables

Table 1

Information presented in the low-information-processing-demand conditions

Event	Maryland	Duke
Relay Race	6th	3rd
Discus	1st	6th
Sprint	5th	2nd
Hurdles	3rd	3rd
Decathlon	5th	3rd
Javelin	3rd	5th

List of figures

Figure 1

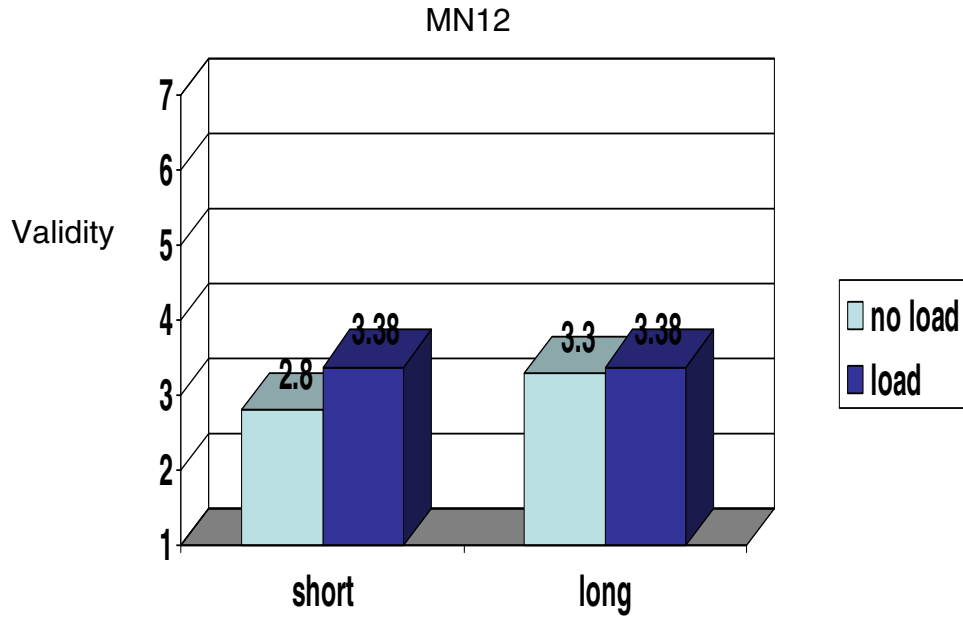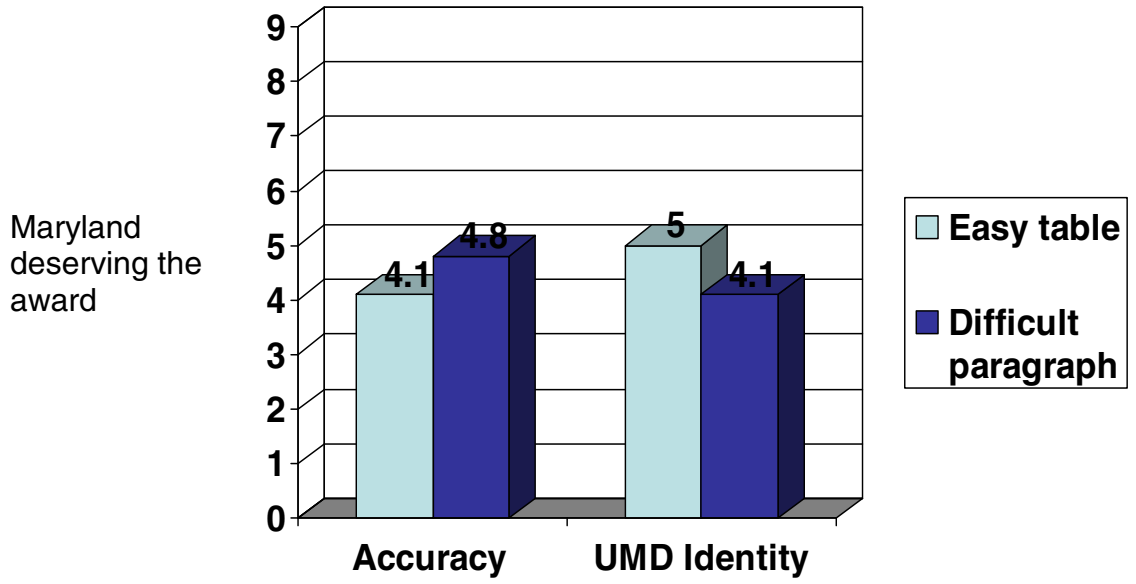*Bias in validity judgment using index (MN12) combining responses to both DV questions*

MN12

Figure 2

*Bias in judgment favoring UMD wining award using single index combining
responses to all four DV questions*

Maryland
deserving the
award

Appendices

Appendix A

Simple/short version of the information

Analytical ability has been seen as one of the key abilities that determine students' academic success. Some research strongly suggested the promise of the analytical section: it appeared to measure an ability that was distinguishable from the verbal and quantitative abilities measured by the test.

However, a recent research on development and validity of the analytical section in six fields (English, education, engineering, chemistry, computer science and psychology) revealed that there is substantial difference in perceived importance of different dimensions or factors, for example, analysis and evaluation of arguments was judged to be most important in English, defining and analyzing problems most important in computer science and engineering, and generating alternatives most important in psychology and education.

Despite this, several analytical skills that the test examines have been found universally important. For example, such general skills as "reasoning or problem solving in situations in which all the needed information is not known" are viewed as extremely important in all disciplines.

Appendix B

Complex/long version of the information

Analytical ability has been seen as one of the key abilities that determine students' academic success. Some research strongly suggested the promise of the analytical section: it appeared to measure an ability that was distinguishable from the verbal and quantitative abilities measured by the test. However, a recent research on development and validity of the analytical section in six fields (English, education, engineering, chemistry, computer science and psychology) revealed that there is substantial difference in perceived importance of different dimensions or factors. Skills involved in (a) the analysis and evaluation of arguments, (b) the drawing of inferences and the development of conclusions, (c) the definition and analysis of problems, (d) the ability to reason inductively, and (e) the generating of alternative explanations or hypotheses formed five distinct dimensions, which were perceived as differentially important for success in each of the six disciplines included in the study. In that study, skills involved in analyzing/ evaluating arguments were rated as extremely important in English, quite important in education and psychology, and somewhat less important in the other three disciplines, particularly computer science. Critical thinking skills involved in developing or otherwise dealing with conclusions were viewed as very important in all disciplines except computer science. Abilities involved in analyzing and defining problems were rated as extremely important in computer science and engineering, but less important in other disciplines, especially English. The inductive reasoning skills were rated as moderately important on each of the six disciplines. The skills of generating alternatives/hypotheses were rated very high in psychology and in education, and as somewhat less important in other disciplines, particularly computer science.

Despite this, several analytical skills that the test examines have been found universally important. For example, "Reasoning or problem solving in situations in which all the needed information is not known" was the skill rated as most important overall. Such skills as 'detecting fallacies and logical contradictions in arguments," "deducing new information from a set of relationships, " and "recognizing structural similarities between one type of problem or theory and another" were the next most highly rated skills. These were followed closely by "taking well-known principles and ideas from one area and applying them to a different specialty," "monitoring one's own progress in solving problems," and "deriving from the study of single cases structural features or functional principles that can be applied to other cases." Also, the analytical section was seen as reflecting the most serious reasoning errors across all disciplines. These reasoning errors include "accepting the central assumptions in an argument without questioning them," "being unable to integrate and synthesize ideas from various sources," and "being unable to generate hypotheses independently".

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