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The Affective Self-regulation of Covert and Overt Reasoning in a Promotion vs. Prevention Mind-set

Abstract: *The main hypothesis of studies presented in this article is that episodic implicit evaluations (affects) toward task-relevant objects determine thinking and decisions by actively placing them within or outside the scope of attention. In these studies we also aimed to test the impact of regulatory focus on implicit evaluations and goal pursuit. We applied the Promotion-Prevention Self-control Scale as a measure of mind-set during thinking in the Wason Selection Task (WST) in Study 1 and Island Decision Game (IDG) in Study 2. Directly after learning of the tasks, participants evaluated (in affective priming paradigm) objects that constituted the task's content. The findings are in line with the hypothesis stating that goals influence the way in which objects are automatically evaluated. The effects of promotion mind-set were more pronounced in both studies. Promotion-focused individuals positively assessed objects that serve as a confirmation. The implicit evaluations by prevention-oriented individuals disclosed their falsifying approach to the WST. The positive implicit evaluation of correct objects suggests their sensitivity to information useful for falsification and is consistent with their tendency to cautiously self-control thinking.*

Key words: *affect, self-regulation, attention, reasoning, promotion versus prevention focus Wason Selection Task*

Since Bruner and Goodman (1947) showed in their classic experiment that children overestimate desired objects (namely coins and particularly when they were poor), researchers have provided ample evidence on the valuation of the goal itself and of the objects linked to it. Once the goal has been chosen, it automatically becomes positive, although one may not realize it (e.g. Ferguson, 2008). Affect is an elementary evaluative operation motivating to or from the object (goal). It differs from much more complex and more conscious emotional process, developing action program in situation (e.g. Barrett, 2012). Positive affect is an implicit motivator (Custers & Aarts, 2005), whereas negative affect acts as an inhibitor of motivation when co-activated with the goal (Aarts, Custers, & Holland, 2007). Valuations and devaluations of goal-relevant objects were observed in numerous studies (Ferguson & Bargh, 2004, Custers & Aarts, 2005, see meta-analysis by Johnson, Chang, & Lord, 2006).

A review of the research concerning goal-directed activity suggests that implicit evaluations increase the accessibility of goal-directed representations. Therefore, this accessibility is shaped in an active, motivated manner.

We suggest that *positively marked representations are accessible to attention, whereas negatively marked contents are automatically inhibited and removed from attention.*

There is a basic difference between functions of affect triggered directly and indirectly – during a telic activity. Affect attributed to a cognitive representation as the attitude (e.g. to a leech) is activated together with the concept or picture. However affect can be attributed to the same cognitive representation via additional evaluation of its functionality with respect to the goal. This may be (1) *the treatment of a patient who needs the anticoagulant substance produced by leeches, what causes positive implicit evaluation / affect toward a leech, or (2) the classification of varied inanimate objects (concepts), where leeches become negatively evaluated distractors (which overload attentional control). This episodic negative affect to leeches (added to negative attitude) “push” distractors out of attention.*

It is well documented that objects recorded in memory with a positive or negative meaning can easily engage our attention, which results in their chronic high accessibility. For instance, Roskos-Ewoldsen and Fazio (1992) have shown that people automatically focus their

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eyes on things that activate non-conscious attitudes (objects that are permanently associated with affect in memory, for example, word such as *murder*). There are many similar attention studies and the majority show a negativity effect or higher level of accessibility of negatively evaluated objects (Peeters & Czapiński, 1990; Lewicka, Czapiński, Peeters, (1992); Baumeister, Bratslavsky, Finkenauer, & Vohs, 2001; Pawłowska-Fusiara, 2004). Even if this result is not as obvious as previously believed (see Rothermund, 2011), negatively evaluated objects definitely engage our attention.

We assume by contrast, that *non-functional and therefore negatively evaluated objects in goal-directed activity are inhibited and shut out of control (executive attention)*. Therefore, negative affect plays a role of the inhibitor of goal-irrelevant, overloading information. This is why shampoo may unconsciously become a negatively evaluated and neglected liquid when you are thirsty (Brendl, Markman, & Messner, 2003).

Similar changes occur after we complete a task and when the task-related goal no longer organizes our motivation. For example, the letter “c” is no longer favored when the subject has completed the task of forming words beginning with “c” (Ferguson & Bargh, 2004; Förster, Liberman & Higgins, 2005). Information that is not functional for further action and thinking is inhibited because it would only clutter attention (see also Kolańczyk, 2008; Roczniowska & Kolańczyk, 2012, Kolańczyk (red.; 2014).

The affective regulation of thinking as a function of promotion versus prevention focus

Kolańczyk (2008) assumed that the evaluations depend not only on the goal itself but also on the subjects' regulatory focus (promotion versus prevention). Promotion-focused individuals pursue ideal visions of the future, focus on their accomplishments, and attend more to gains than losses. Prevention-focused individuals are motivated by obligations and responsibilities and the desire to obtain security, they are more concerned with avoiding failure and making mistakes than with attaining gains (Higgins, 1997). The tendency of the promotion-focused subjects to commit errors of false alarms and the prevention-focused subjects to make errors of omission was demonstrated in earlier research (Crowe & Higgins, 1997; Higgins, Friedman, Harlow, Idson, Ayduk, & Taylor, 2001). It may be inferred that promotion mind-set fosters propensity to confirmation and prevention facilitates tendency for rejection of hypothesis in thinking. We verify this hypothesis in the first study. The second study examines whether promotion focus determines attentional sensitivity to potentially helpful information and prevention focus “opens” attention for both: helpful and disturbing information.

Since thinking is a series of decisions that are to a large extent unconscious, these must be undertaken due to automatic engagement of executive attention. Therefore, we expect implicit evaluations as determinants of attentional biases typical for regulatory focus in covert reasoning (Study 1), and in overt decision making (Study 2). Although

motivation is always associated with positive valuation of the goal and related objects, people differ in evaluations depending on regulatory focus (Kolańczyk, 2008). In promotion focus, the scope of attention includes contents that bring the individual closer to the goal as a result of their valuation, whereas in prevention focus the scope of attention includes any potential trap and deviation from the chosen direction, and these are also valued. Only items that should be inhibited are devaluated as an information noise (Roczniowska & Kolańczyk, 2012).

Wason's Selection Task (WST) – propensity to confirmation vs falsification of hypotheses

A prevention-focused mind should be particularly skillful at solving tasks that require comprehensive testing, including falsification. An example of such task is WST using cards with symbols on both sides (Johnson-Laird & Wason, 1970). In its classic, abstract form, the cards are arranged so that the subject can see a vowel (A), a consonant (K), an odd number (5), and an even number (4). The subject turns over the selected cards to test the truth of the proposition: “*If there is a vowel on one face, then the other face shows an even number*”. The correct verification of the rule involves selecting the card that potentially confirms it (A) and one that may falsify the proposition (5). The problem is that fewer than 7% of subjects (on average) are able to solve it correctly (Oaksford & Chater, 1994). The most people only invert the card indicated as the antecedent of the implication (a vowel) and attempt to confirm the rule, thus committing the confirmation error. Such behavior may result from positive emotions (Lewicka, 1992) or from promotion focus, which involves the automatic detection of objects that are consistent with the rule.

Jakitowicz (2008) observed that prevention-focused individuals are actually better at solving the abstract version of the Wason task but not the concrete, real-life version; the falsification focus is highly required to solve the former. Fallacies in abstract reasoning may result from a large number of mental operations required for full verification, including attempts to falsify the rule. The most important and resource-absorbent operation in this process is negation. Complete reasoning cycles or testing all the necessary and sufficient conditions are not always required when the rule is applied to a concrete, real-life situation. The problem space is simplified when the task becomes concrete and the individual uses activated (accessible) experience and pragmatic reasoning schemas to solve the problem (Holyoak & Cheng, 1995).

Promotion focus involves more extensive, global, and shallow processing (Semin, Higgins, de Montes, Estourget, & Valencia 2005; Förster & Higgins, 2005, Kolańczyk, 2012); these individuals invest less effort in complex semantic operations. Therefore, it may be assumed that *objects confirming the rule that come to individual's minds when they engage in shallower processing are more likely to be selected and valued by the promotion-focused individuals. In turn, prevention-focused individuals should account and value useful objects for falsification.*

Study 1

As it is difficult to observe all possible directions of thinking in the abstract version of WST in which accurate answers are very rare, we decided to use concrete version of WST. What is more, *we anticipate different attentional bias (caused by implicit evaluations of means) for prevention and promotion mind-sets on the very beginning of thinking.* Therefore, although we expect correct solution regardless of mind-set, it should follow different evaluations of objects from problem space in promotion and prevention. We expect positive affect towards accessible objects in promotion focus (because of shallow and wide information processing), however in prevention focus (with deeper and more local information processing) – towards objects useful in negation of the rule¹.

Method

Participants

A total of 163 participants took part in this experiment, and the study was conducted via the Internet. Data from 17 subjects who failed to solve WST correctly and 12 participants who committed different kinds of errors in the priming procedure (explained below) were excluded from the sample. Data from the remaining subjects ($N = 134$) were included in the statistical analyses. There were 79 women and 22 men; for the remaining 33 individuals gender was not determined because of an error in the script². The mean age was $M = 23.54$ ($SD = 4.96$).

Materials

Promotion and Prevention Self-regulation Scale (PPSS). We administered a newly developed questionnaire to gauge participants' regulatory foci (Kolańczyk, Bąk & Roczniowska, 2013). It consists of 27 items that allow measuring the level of promotion and prevention, and also strength of motivation. The internal consistency (reliability) of the scale in our current study was also satisfactory: Cronbach's $\alpha = .822$ ($N = 134$). For promotion scale $\alpha = .845$, for prevention scale $\alpha = .797$.

Wason Selection Task (WST) activation.

The instructions appeared on the computer screen and requested the participants to imagine they were a waiter in a café and required to obey a binding law: "Only clients over 18 are allowed to drink alcohol." There were 4 cards below

the rule; one side of each card represented a client's age, and the other side specified the drink he or she would purchase. Two cards showed the clients' ages and the remaining two showed the drinks (Fig. 1). The subject's task was to decide which cards had to be inverted to test the truth of the rule.

Meaning of cards selection:

- The *age under 18* – falsification of the rule, i.e. logically correct selection.
- The *age over 18* – confirmation of the rule – testing on the basis of presence in the hypothesis.
- The *alcoholic drinks* – the implication antecedent that participates in the two kinds of validation of the rule (confirmation and falsification) as the „anchor point”.
- The *non-alcoholic drinks* – switching of the rule.

Implicit evaluations

Evaluated objects were selected according to their relevance to the WST and included two age categories, under and over 18, and 2 categories of drinks: alcoholic and non-alcoholic. Twenty-one individuals were asked to list the first 5 alcoholic and 5 non-alcoholic drinks to generate examples of these categories. Subsequently, 34 individuals rated all of the listed objects on a 1 (strongly negative) to 5 (strongly positive) scale. For the affective priming procedure, we selected 5 alcoholic and 5 non-alcoholic drinks that were rated as the most neutral (the mean was from 2.5 to 3.5). The alcoholic drinks were *tequila, martini, liqueur, beer, and champagne*, and the non-alcoholic drinks were *orangeade, Fanta, Pepsi, Sprite, and milk*. When the ratings distribution was tested against the mid-point on the scale, it was observed that inclinations to make positive and negative evaluations were very small and balanced between categories. For the under and over 18 age categories we used 13, 14, 15, 16, 17 and 19, 23, 25, 27, 31, respectively.

The target words were clearly valenced adjectives (e.g., *excellent, disgusting*) that have been used in previous studies (e.g., Roczniowska & Kolańczyk, 2012; Kolańczyk, Reszko & Mordasiewicz, 2013). There were 20 adjectives, and these were rotated through the trials.

The affective priming procedure

We measured automatic evaluations via an affective priming paradigm (Fazio, Sanbonmatsu, Powell & Karde, 1986; Fazio, 2001). The primes were examples of the 4 object categories represented in the WST and were followed by an adjective. Participants were informed that they would see a pair of words on each trial and that they should

Figure 1 . The cards used in the Study 1.



¹ Förster and Higgins (2005) have shown global information processing in promotion vs. local in prevention. See also Kolańczyk, (2011).

² These participants used Mac Computers with different coding of the letters which we assigned to gender question responses

evaluate the second one as positive or negative by pressing a corresponding key (+ or -). They were asked to act as quickly and as accurately as possible. Each trial began with a presentation of a fixation point in the center of the screen (for 500 ms). An object was subsequently presented for 200 ms followed by a blank screen (150 ms) and then a target adjective. The adjective remained on the screen until the subject responded to it by pressing the + or - key. The adjectives were rotated through the trials. The inter-trial interval was 2000 ms. The participants completed also 4 practice trials. Each of the 16 objects (4 categories x 4 examples) was paired once with a positive and once with a negative adjective.

Design

Target adjective valence (positive, negative) and prime / object in problem space (alcoholic drinks, age below 18, non-alcoholic drinks, age over 18) were within-participant variables. The WST-status (task vs. no-task) and regulatory focus (promotion vs. prevention) were the two between-participants variables.

Procedure

In the WST condition, participants became acknowledged with the task however before they were actually able to solve it – we administered implicit evaluations measurement. In contrast, participants in control (base-line) condition were presented with the implicit evaluation task straightaway. For both groups, the task was described as a series of evaluative judgments.

The research procedure was programmed in *Inquisit*, and the study was performed online using *Inquisit 3.0.3.2Web*. The respondents were invited to participate in the study through social networking sites and the www.badania.net website. The participants were informed that the study concerned attention and the results would only be gathered for scientific purposes. The participants were also asked to confirm that they had 15 minutes during which nothing was going to disturb them because the task should be completed without interruptions. They were then presented with WST without being asked to provide a solution, and they were informed that they would return to the puzzle later. Their task at the moment was to decide whether the words displayed on the screen were pleasant or not.

At the next stage, WST was again presented, and the subjects were asked to provide their solution by entering the correct card numbers in a box that appeared on the screen.

Following the WST, participants were asked to fill in the PPSS questionnaire. Finally, the participants were presented with the correct solution and asked to provide personal data (age, gender, and e-mail address). After the study was finished, participants were debriefed, informed about the results and thanked for their participation.

Expectations

As far as our predictions for the applied task are concerned, in the promotion mind-set, attention should be automatically oriented to the most accessible data which result in (1) the *confirmation* of the hypothesis through the valuations of *age over 18*, or (2) *the switching of the rule* through the valuation of *non-alcoholic drinks*. In the prevention mind-set attention should be automatically oriented to data which allow to reject the hypothesis through the valuations of objects *useful in falsification*, that is *age under 18*. We assumed that although the task is easy for about 80% of participants attentional bias should occur at the beginning of thinking.

Results

The reaction times (RTs) in the affective priming task were only analyzed for the correct responses (see: Ferguson & Bargh, 2004). The error rate was 3.73%. RTs that were 3 standard deviations above and below an individual's mean RT were dropped, as were RTs that were below 250 ms. Because RTs are negatively-skewed, RT's as short as 3 *SD* below an individual's mean would be lower than 0³, therefore we applied the RT = 250 ms for excluding "false starts" (see also Ferguson & Bargh op. cit.). These eliminations constituted 2.38% of all responses. Analyses were performed on log-transformed data, but non-transformed RTs are presented in Figure 2 and Table 1.

Mind-set

Participants were initially divided into two groups differing in regulatory focus. It was performed using the procedure applied during the development of the Regulatory Focus Questionnaire (Higgins et al., 2001). The differences between promotion and prevention scores for each participant were calculated. The obtained results were divided according to the median with its value suggesting a slightly higher promotion focus in the sample (*Mdn* = .47). Values above the median were indicative of promotion focus, whereas values below the median indicated prevention focus. The differential variable of mind-set (subtraction of prevention from promotion results) was also divided according to tertiles (promotion < 0.125 and prevention > 0.796), to observe the effects in more extreme groups.

Implicit evaluations

We used the *IBM SPSS 21* package to analyze the data and introduced a repeated-measures analysis of variance (ANOVA) with group (2: task activation vs. no-task activation), mind-set (promotion vs. prevention), objects (4: alcoholic drinks, age above 18, non-alcoholic drinks, age below 18), and target adjective valence (2: negative positive) with the last two as within-subject variables.

The interaction between the variables is statistically insignificant, $F < 1$, therefore we decided to look into the

³ Indeed, in both studies we observed no RTs 3SD below individual's mean

effects of experimental (task-activation) and control (no-task activation) groups separately.

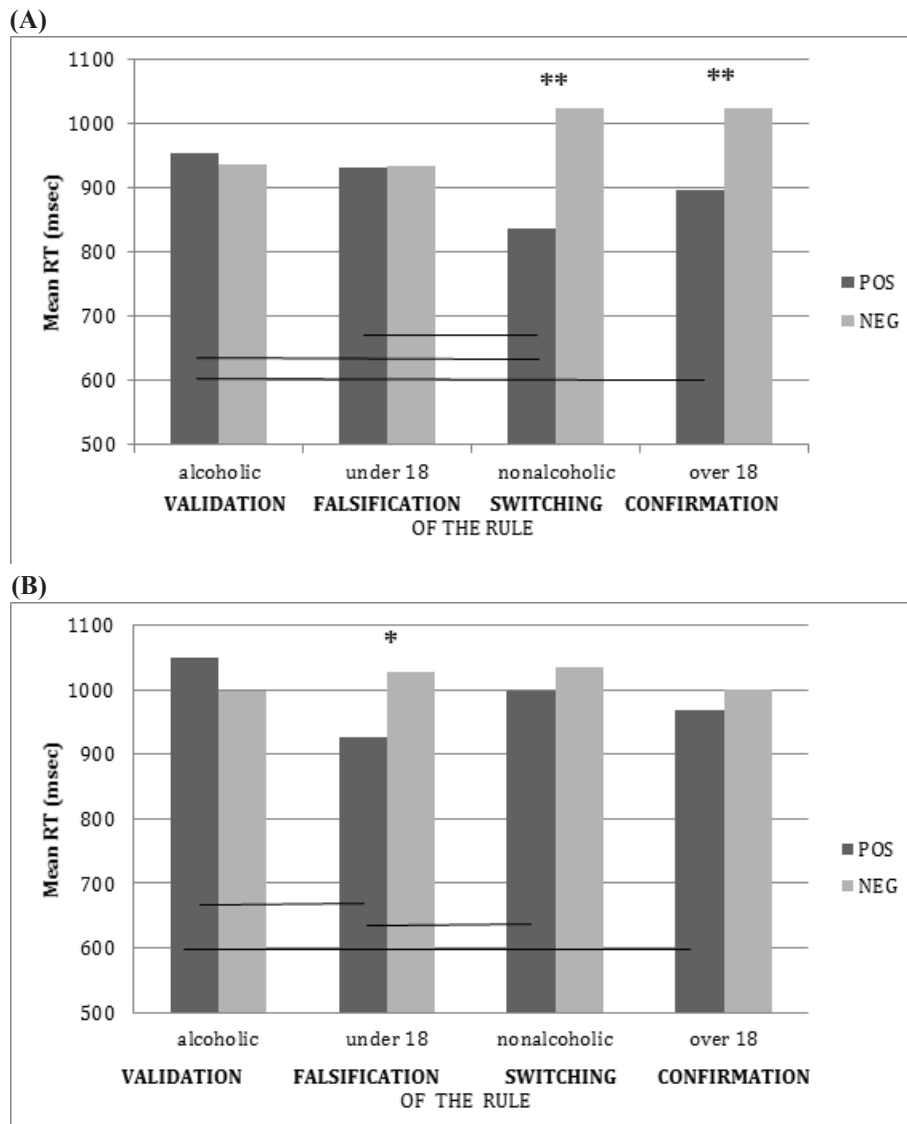
Experimental group with activated WST

The interaction between the regulatory focus, object, and target adjective valence was significant, $F(3,252) = 3.14$ $p = .04$; $\eta^2 = .05$. A main effect of target adjective valence was also observed, $F(1,42) = 9.66$; $p = .003$; $\eta^2 = .10$, which suggests a tendency to evaluate all objects positively, $M_{neg} = 996.46$ ($SD = 41.28$) $>$ $M_{pos} = 948.87$ ($SD = 36.47$). Only one intergroup simple effect was observed – for RT to positive adjectives after *nonalcoholic drinks* (indicator of switching of the rule): $t(84) = 2,002$, $p < .05$, $d = 0,41$ ($M_{pre} = 998,57$, $SD = 349,27$; $M_{pro} = 863,25$, $SD = 311,58$). Promotion focus (compared with prevention) fosters approach to these objects.

Independent analysis of variance (object x target adjective valence) were conducted separately for promotion-focused and prevention-focused individuals. For promotion interaction of objects and target adjective valence was more pronounced: $F(3,126) = 4.014$; $p = .009$; $\eta^2 = .087$ than for prevention-focused individuals: $F(3,126) = 2.403$; $p = .071$; $\eta^2 = .054$. The significant impact of the target adjective valence was observed only in the first group: $F(1,42) = 9.33$; $p = .004$; $\eta^2 = .182$. $M_{neg} = 977.70$ ($SD = 61.06$) $>$ $M_{pos} = 911.65$ ($SD = 50.02$).

We also tested the significance of implicit evaluations (differences between the RTs to negative and positive words for each object) with the use of paired samples t- test, separately for promotion and prevention (Fig. 2). This is the real indicator of affect with respect to the object.

Figure 2. The relationship between the implicit evaluations of objects and regulatory focus (A) promotive and (B) preventive



Note: Stars mark significant differences in implicit evaluations (the positive implicit attitude); * $p < .05$ ** $p < .01$ Black lines mark significant differences between objects' positive associations. The subtitles indicate the meanings of a particular choices.

Promotion-focused individuals showed positive valuation of 2 objects: (1) *non-alcoholic drinks* indicating reversal of the rule; $M_{neg} = 1024.57, SD_{neg} = 556.77; M_{poz} = 863.25, SD_{poz} = 311.58; t(42) = 3.17; p = .003$; Cohen's $d = .62$, and (2) *age over 18* indicating confirmation of the rule: $M_{neg} = 1013.12, SD_{neg} = 485.62; M_{poz} = 896.39, SD_{poz} = 361.32; t(42) = 3.29; p = .002$; Cohen's $d = .56$. Implicit evaluations of *alcoholic* and *age under 18* objects were insignificant.

Reactions to positive adjectives were faster for the valuated objects – *non-alcoholic drinks* in comparison with *alcoholic drinks* (i. e. the implication antecedent neutral for participants): $M_{nonalc} = 863.25, SD_{nonalc} = 311.58, M_{alc} = 954.59, SD_{alc} = 404.80; t(42) = 2.38; p < .05$; Cohen's $d = .37$, and also in comparison with age under 18: $M_{under18} = 932.39, SD_{under18} = 364.04, t(42) = 2.06; p < .05; d = .32$, indicating high accessibility of the rule reversal.

Prevention-focused individuals valued only one object: *age under 18* that is the indicator of falsification; $M_{neg} = 1026.74, SD_{neg} = 415.39; M_{poz} = 927.20, SD_{poz} = 343.79; t(42); p = .003$; Cohen's $d = .34$. Comparisons of implicit evaluations of *alcoholic*, *nonalcoholic*, and *age over 18* objects were insignificant.

Reactions to positive adjectives were faster for valuated object – *age under 18* in comparison with not evaluated *alcoholic drinks*: $M_{under18} = 927.2, SD_{under18} = 343.79; M_{alc} = 1050.17, SD_{alc} = 491.33; t(42) = 2.36; p < .05$; Cohen's $d = .38$., and also in comparison with *non-alcoholic drinks*: $M_{nonalc} = 998.57, SD_{nonalc} = 349.27; t(42) = 2.19; p < .05$; Cohen's $d = .34$. However, *age over 18* was also faster attributed to positivity than *alcoholic drinks*: $t(42) = 2.10; p < .05$; Cohen's $d = .33$ showing power of accessibility of priming. i.e. of items present in the rule.

Control group – with no WST

The interaction between the regulatory focus (2), object (4), and target adjective valence (2) was insignificant

($F = 1.086; p = .36; \eta^2 = .023$). Moreover independent interactions between objects (4) and target adjective valence (2) were insignificant for promotion-focused individuals ($F < 1$) and for prevention-focused individuals ($F < 1$). No object was valued or devalued (insignificant simple effects for RTs to positive and negative adjectives). Table 1 shows the mean RTs for control condition.

The analysis of more extreme promotion and prevention groups (divided according to tertiles and accounted on log-transformed data) confirmed most of these results. For *promotion group* interaction of object and target adjective valence was significant, $F(3,24) = 3, p < .05, \eta^2 = .633$. Promotion-focused individuals showed valuation of 2 objects: (1) *non-alcoholic drinks* indicating reversal of the rule; $M_{neg} = 1015.42, SD_{neg} = 518.89; M_{poz} = 870, 14, SD_{poz} = 336.6; t(26) = 2.68; p = .013$; Cohen's $d = .37$, and (2) *age over 18* indicating confirmation of the rule: $M_{neg} = 971.51, SD_{neg} = 400.71; M_{poz} = 860.33, SD_{poz} = 256.944; t(26) = 2.20; p = .037$; Cohen's $d = .33$. Comparisons of implicit evaluations of *alcoholic* and *age under 18* objects were insignificant.

For *prevention group* interaction of object and target adjective valence was not significant, $F(3,28) = 1.25, p < .31, \eta^2 = .3$. Nevertheless we checked simple effects (differences between RTneg and RTpoz), obtaining only weak positive evaluation of the falsifying object (*age under 18*); $M_{neg} = 1036.3, SD_{neg} = 443.39; M_{poz} = 956.23, SD_{poz} = 374.89; t(30) = 1.53, p = .068$ one-sided test; Cohen's $d = 0.25$.

Discussion

The implication antecedent (*alcoholic drinks*) participates in two kinds of validation of the rule (confirmation and falsification) as the „anchor point”, and was evaluated as the neutral and obvious item. Individuals with a disposition to promotion focus positively valued the two categories of objects that constitute incorrect solutions

Table 1. The mean reaction times in milliseconds by mind-set, object, and target adjective valence in the control group (no task) in Study 1.

Object	Promotion (N = 21)		Prevention (N = 26)	
	Negative adjective	Positive adjective	Negative adjective	Positive adjective
Alcoholic				
M	960.20	955.30	959.22	921.93
SD	542.35	465.16	405.56	350.14
Under 18				
M	917.35	829.33	991.63	986.79
SD	355.87	336.00	467.82	667.68
Non-alcoholic				
M	971.16	849.52	968.59	1068.98
SD	484.30	266.63	403.83	816.56
Over 18				
M	894.42	863.96	929.96	943.68
SD	416.42	233.07	358.96	506.11

to WST: one leading to the confirmation fallacy (*age over 18*) and the other indicating the error of switching of the rule (*non-alcoholic drinks*). The patterns of objects valuation suggest that promotion-focused individuals automatically attend to objects that appear in shallower processing, that is, ones that confirm the rule and assume a reversibility of the implication.

Prevention-focused individuals positively evaluated objects which were necessary to falsify the rules (*age under 18*). It is consistent with their predicted tendency for cautious self-control of thinking. However, this effect is weak in extremely prevention-focused group (tertiles division). It may be said that preventive mind-set at least protects against valuation of the most accessible objects, with inclination toward the negation of the rule (equivalent to the falsification). However, falsification in WST requires less intuitive operations, therefore effect of appropriate cards valuation at the very beginning of reasoning have been weak. The implicit evaluations differed between the promotion- and prevention-oriented individuals and yet – both groups reached the correct solutions. This suggests that valuation plays a role in orienting attention, however further information processing may follow different strategies. Especially, since we administered the concrete version of WST which participants can solve based on experience and not complicated logical reasoning, as it is the case with the abstract version. However, these attentional biases should be confirmed in a separate experiment, in which measurement of objects accessibility replace the measurement of their implicit evaluations.

Study 2

The former study demonstrated differences in automatic evaluations that occur at the beginning of thinking for promotion- and prevention-oriented people. Since they related to cognitive operations a person has to conduct in thinking, they represent more subtle, “hidden” actions that take place in one’s mind. The aim of this study was to examine the influence of regulatory focus on the series of decision-making that occurs as more explicit and overt actions. Taking into account results of Study 1 and Roczniowska and Kolańczyk’s previous studies (2012) we hypothesized that promotion-oriented participants exhibit positive implicit evaluations towards objects that help reach the aim. We also predicted that prevention-oriented participants exhibit positive implicit evaluations towards both objects that help and hinder reaching the aim.

Method

Participants

Eighty participants took part in the study for course credit, of whom 33 were men and 47 were women. Their age ranged from 19 to 35 ($M = 25.32$; $SD = 6.18$).

Materials

Promotion and Prevention Self-Regulation Scale (PPSS). We administered the same questionnaire as in Study 1. The reliability of the scales in the current study was also satisfactory: for promotion scale $\alpha = .81$, for prevention scale $\alpha = .75$.

Task activation. Participants were invited to play a computer game, wherein they would act as a wanderer looking for a treasure on an island inhabited by two tribes: Atomites (positively inclined who give true advice on how to reach the treasure) and Tyromites (negatively inclined, willing to deceive and give false advice). They were informed the names of the members of each tribe started with Ato- or Tyr- (respectively). Participants would wander around and meet 10 people one after another in a random order. They would be told the name of this person and asked, whether they want to approach them for advice. In case they did, they would be given the advice, and then a chance to act accordingly or not. After each decision participants were able to observe their movement, which was depicted as a red line on an image of an island.

Implicit attitudes measurement. We used the same affective priming paradigm as in Study 1. Objects were selected according to their relevance to the game (see above) and included the names of five Atomites (e.g. Atostar), five Tyromites (e.g. Tyrostar) and 20 names that started with other letters of the alphabet (e.g. Ulostar). The target words were clearly valenced adjectives (e.g., excellent, disgusting) that have been used in previous studies (e.g. Roczniowska & Kolańczyk, 2012; Kolańczyk, Reszko & Mordasiewicz, 2013). There were 20 adjectives, and these were rotated through the trials.

Design. Target adjective valence (positive, negative) and object (helpful vs. disruptive vs. unrelated) were within-participant variables. The goal-status factor (goal vs. no-goal) and regulatory focus (promotion vs. prevention) were the two between- participants variables.

Procedure. Participants were randomly assigned to the goal-status conditions and were seated at computers individually. In the goal condition, participants became acknowledged with the game and its rules, however before they were actually able to play it – we administered implicit attitudes measurement. In contrast, participants in the no-goal condition were presented with the implicit evaluation task straightaway. For both groups, it was described as a series of evaluative judgments. Participants were informed that they would see a pair of words on each trial and that they should evaluate the second one as positive or negative by pressing a corresponding key (+ or -). They were asked to act as quickly and as accurately as possible. Each trial began with a presentation of a fixation point in the center of the screen (for 500 ms). An object was subsequently presented for 150 ms followed by a blank screen (150 ms) and then a target adjective. The adjective remained on the screen

until participant responded to it by pressing the + or - key. The adjectives were rotated through the trials. The inter-trial interval was 2000 ms. The participants completed 4 practice trials (with unrelated stimuli). Each of the 15 objects (3 categories x 5 exemplars) was paired once with a positive and once with a negative adjective.

Following the computer task, participants were asked to fill in the PPSS questionnaire. Afterwards, those in the goal condition were able to play the game. When the study was finished, participants were debriefed, informed about the results and thanked for their participation.

Results

Mind-set. To assign subjects to promotion- or prevention-oriented group, we calculated mean prevention and promotion scores for each participant and subtracted the prevention score from the promotion score, obtaining *mind-set* variable. We conducted a median-split division ($Me = .17$) and consequently values above the median suggested promotion focus, whereas values below the median were indicative of prevention focus. Similarly to Study 1, we administered another division according to tertiles (prevention < -0.036 and promotion > 0.307).

Implicit evaluations. The reaction times (RTs) that were 3 standard deviations below and above an individual's mean RT or shorter than 250 ms and trials with erroneous categorizations of the adjectives (the error rate was 12%) were eliminated. We used the *IBM SPSS 21* package to analyze the data and introduced a repeated-measures analysis of variance (ANOVA) with goal status (2: goal vs. no-goal condition), mind-set (promotion vs. prevention), objects (3: helpful vs. disruptive vs neutral) and target adjective valence (2: positive vs. negative), with the last two as a within-subject variable. The results were calculated for log-transformed data, however the charts and tables demonstrate RTs in milliseconds.

The interaction between the four variables was statistically insignificant, $F < 1$. Hence, we demonstrate interactions for experimental group and control (baseline) group separately. The interaction between mind-set, object

and target adjective valence was insignificant for control group, $F < 1$, but significant for experimental group, $F(2,72) = 3.97$; $p < .05$; $\eta^2 = .09$. In control condition, each object was assessed similarly, regardless of its type and mind-set (see Table 2).

In experimental condition, the interaction between the object and target adjective valence was significant for the promotion-: $F(2,30) = 3.52$; $p < .05$; $\eta^2 = .19$, but not for the prevention-oriented individuals: $F(2,42) = 1.91$; $p = .16$; $\eta^2 = .08$. Multiple one-tailed paired samples t- test examined significance of simple main effects. Figure 3a and 3b depict significant differences between means separately for promotion and prevention focus.

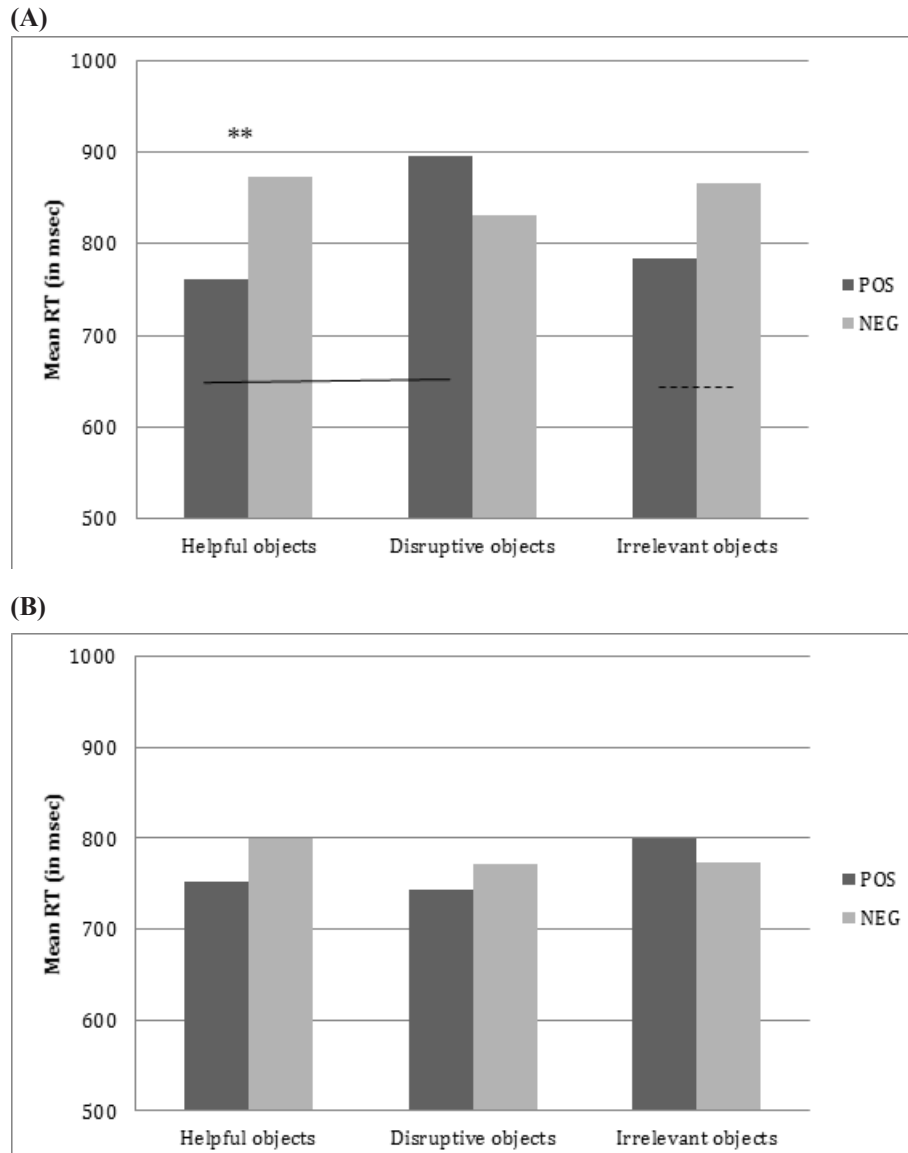
Promotion-oriented participants responded significantly faster to positive adjectives that followed helpful objects ($M_{pos} = 760.88$, $SD_{pos} = 221.67$) compared with negative adjectives ($M_{neg} = 872.72$, $SD_{neg} = 285.21$), $t(15) = 3.49$, $p < .01$, Cohen's $d = .78$. They also responded insignificantly faster to positive adjectives that followed irrelevant objects ($M_{pos} = 783.53$, $SD_{pos} = 170.61$) compared with negative adjectives ($M_{neg} = 865.00$, $SD_{neg} = 306.00$), $t(15) = 1.80$, $p = .09$; Cohen's $d = .60$. Promotion-oriented participants reacted faster to negative than positive adjectives after presentation of disruptive objects ($M_{neg} = 831.24$, $SD_{neg} = 288.54$ vs. $M_{pos} = 895.07$, $SD_{pos} = 493.80$), however the effect is weak (Cohen's $d = .21$) and the difference is not statistically significant, $t < 1$. Moreover, promotion-oriented participants responded significantly faster to positive adjectives followed by helpful than disruptive objects, $t(15) = 1.98$; $p < .05$, Cohen's $d = .64$. Prevention-oriented participants reacted faster to positive adjectives followed by both helpful (Cohen's $d = .32$) and disruptive (Cohen's $d = .19$) objects than to negative adjectives, but the differences were not statistically significant.

We also compared baseline and experimental groups separately for promotion and prevention focus. The analyses revealed that the interaction between goal-status, object and target adjective valence was not significant for prevention-oriented participants ($F < 1$), but it was significant for promotion-oriented participants, $F(2,68) = 3.78$; $p < .05$; $\eta^2 = .10$.

Table 2. The mean reaction times in milliseconds by mind-set, object, and target adjective valence in control group (no goal) in Study 2.

Object	Promotion ($N = 20$)		Prevention ($N = 18$)	
	Negative adjective	Positive adjective	Negative adjective	Positive adjective
Helpful				
<i>M</i>	953.60	907.34	899.19	852.45
<i>SD</i>	469.26	341.53	245.36	287.46
Disruptive				
<i>M</i>	1028.15	881.49	942.34	843.62
<i>SD</i>	465.00	260.60	261.08	263.99
Irrelevant				
<i>M</i>	1016.89	945.56	933.43	849.82
<i>SD</i>	445.85	357.01	267.62	288.85

Figure 3. The relationship between the implicit evaluations of objects and regulatory focus (A) promotive and (B) preventive



Note: Stars mark significant differences in implicit evaluations (the positive implicit attitude); * $p < .05$, ** $p < .01$.

Dash lines indicate trend level.

Black lines mark significant differences between objects' positive associations.

The subtitles indicate the meanings of particular choices.

The analysis for groups divided according to tertiles demonstrated a significant difference between reaction times to positive ($M_{pos} = 730.47$, $SD_{pos} = 196.65$) and negative adjectives ($M_{neg} = 813.20$, $SD_{neg} = 198.99$) that followed helpful objects only in promotion-oriented experimental group, $t(11) = 2.21$, $p < .05$, Cohen's $d = .64$. Other differences were not statistically significant.

Discussion

The findings are in line with the assumptions stating that a goal state influences the way in which objects are automatically evaluated (e.g. Ferguson & Bargh, 2004; Kolańczyk, 2008; Rocznińska & Kolańczyk, 2012). However, this effect was observed only for promotion-

oriented participants, which replicates results obtained in Study 1 and our previous findings that implicit re-evaluations are more pronounced for promotion-oriented participants (Rocznińska & Kolańczyk, 2014). In the case of promotion-focused group, helpful objects that serve as a confirmation are assessed positively. Interestingly, promotion-oriented participants also demonstrate positive implicit evaluation of irrelevant objects. It might result from positive emotions in promotion-oriented participants which entails more extensive attention, encompassing more objects in its span. However, it should be taken into consideration that although this effect is moderate, it is marginally significant. Importantly, promotion-oriented participants responded quicker to positive adjectives that followed helpful than

disruptive objects. This indicates greater positivity towards objects that allow rule confirmation.

Although prevention-oriented participants reacted faster to positive than to negative adjectives followed by helpful and disruptive objects, which could be indicative for positive implicit evaluations of objects that need to be confirmed and those that demand falsification, the effects are weak and insignificant, therefore should be taken with caution. Consistent with our assumptions, no such effects can be observed in control (baseline) groups – all objects are rated similarly. Importantly, items administered in Study 2 (compared to those presented in Study 1) are meaningless words and hence they do not convey any meaning to participants in control conditions, namely – those who did not get acquainted with the game. However, implicit evaluations change with task activation as a result of objects' relevance to the task.

General Discussion

The results of our research on the role of implicit evaluations in the process of thinking are consistent with the hypothesis that implicit evaluations toward task-relevant objects determine the direction of thinking by actively placing them within or outside the scope of attention. We proposed that implicit evaluations of task-related objects determine their episodic accessibility and controlled processing. This is justified indirectly, by the experimental findings that show a difference in the evaluation of objects used in reasoning and decision making by promotion- and prevention-focused individuals.

The evidence-based knowledge that promotion- and prevention-focused individuals use different task solving strategies (Higgins, 1997; Higgins, et al. 2001) and earlier observations of the effects of valuation and devaluation in the process of thinking (Ferguson & Bargh, 2004; Ferguson, 2008; Kolańczyk, 2008; Roczniowska & Kolańczyk, 2012), formed the basis for a hypothesis concerning the relationship between implicit evaluations and the contents of attention. Based on a review of the previous research, we proposed that promotion-focused individuals positively evaluate objects that bring them closer to the goal, i.e., any objects that are “good enough” for solving the problem. The broad attention scope leads to superficial information processing and “produces” proneness to accessibility heuristics.

These hypotheses were tested first by administering WST that requires selecting objects inconsistent with the provided rule in attempt to falsify it. This manner of thinking is consistent with the typical cognitive inclinations of prevention-focused individuals; therefore, these individuals are more likely to solve this task correctly (Jakitowicz, 2008). In Study 1 we used an easy, concrete version of the Wason task to ensure a high level (80%) of correct solutions. It appears likely that the inclination to test the necessary and sufficient conditions to reach the correct solution, which is typical for the prevention-focused individuals, would direct their attention toward objects useful for falsifying the rule. Consequently, such objects were positively evaluated by them. However this effect of valuation at the very beginning

of reasoning is weak (in extremely preventive focus group), because falsification requires some analysis. Therefore, preventive mind-set at least protects against valuation of the most accessible objects, but also inclines toward the falsification of the rule.

In case of promotion-focused individuals, valuations concerned the objects which were included in the rule or resulted from its extension (reversed inferences). We infer that attention was automatically directed to these more accessible information. Bearing in mind that we conducted analyses only for participants who gave correct solutions to the task, our first experiment obviously showed that valuation referred not only to the objects of the final decision, but also those that initially engaged attention due to mind-set inclinations. However, because the accessibility was measured indirectly, through implicit evaluations of objects forming problem space, direct proof of objects accessibility as the indicator of attention engagement is still required. Attentional biases should be confirmed in separate experiment, in which measurement of objects accessibility replace the measurement of their implicit evaluations. Moreover, one of the limitations of Study 1 is the fact that it was conducted via the Internet; consequently, the researchers could not control for distractions and assure that the goal of the study was of most significance to participants. It is therefore important to replicate the study in the laboratory.

The second study replicated the results of Study 1: objects that allowed participants to reach a confirmation (tribe members who only gave true advice on how to reach the treasure) were assessed positively. However, this holds true only in the case of promotion-oriented participants. These subjects also demonstrated a slightly positive implicit evaluation of objects unrelated to the task. This effect may result from extensive attention, encompassing a larger number of items that could potentially be included in the solution. According to Kolańczyk (2008) this forms the basis for creativity in promotion-oriented participants, observed in numerous studies (e.g., Friedman & Förster, 2001; Roczniowska, Retowski, Osowiecka, Wronska, & Słomska, 2013). This study also confirmed previous findings that affective responses as reactions to task introduction are less pronounced for prevention-oriented individuals (Roczniowska & Kolańczyk, 2014). However, the results for more extreme groups (tertile split) were not as pronounced, and the analyses were conducted on small group samples, therefore the study should be replicated.

Our findings point to the affect-driven inclusions of objects in the scope of attention, which act as an important contributor to reflective information processing. When positive affect is assigned to selected elements of the problem space, we are inclined to intentionally process these elements and perform operations that require conscious control. For instance, after we determine the arrangement of the pieces on the chessboard, only some become subject to valuation (and only the valued ones are subject to attentive scanning) until we make a decision regarding the next move (preceded by another valuation). The Wason Selection Task allowed us to identify individuals whose thinking

style does not facilitate reaching the solution, at least did not lead straight to the right answer (promotion-focused individuals). This helped us track how motivated reasoning progressed at the beginning of the process, rather than only before making the final decision.

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