

Goal Attainments and the Role of Metacognitive Self in Task Accomplishment

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Based on metacognition theories we present a construct of metacognitive self (MCS) as self-awareness of biases. Contrary to counterintuitive idea metacognitive self fosters self-regulation in the area of goal's attainment. Study 1 ($N = 118$) showed that high metacognitive self individuals created more clear mental picture of their plans than low metacognitive self counter partners. Moreover participants high in metacognitive self undertook more actions to fulfill their goals than low MCS colleagues. Study 2 ($N = 201$) revealed that high metacognitive self individuals strive for autonomy and they work much better to attain their goals in the no load settings, while low metacognitive students work much better under supervision.

Keywords: metacognitive self, motivation, goals and plans, cognitive load, autonomy

Theoretical Background on Metacognition and Metacognitive Self

The theoretical foundation to describe the meaning of the construct of metacognitive self for human performance are explorations of metacognition interpreted as higher functions of our conscious life (e.g. Flavell, 1979).

Thinking about cognition dates back to Heraditus of Ephesus and his epistemological theory. In modern philosophy Kant's precursor, Descartes, having contemplated the real nature of human cognition added his own famous *Dubito, ergo cogito, ergo sum* ("I doubt, therefore I think therefore I am"), thus assuming a human ability to question the correctness of one's own cognition. Philosophy, the Vienna Circle in particular (Karl Popper), does not concentrate on the insight into one's cognition but rather demonstrates the rules that should drive scientific reasoning (the well-known Popper's postulate of falsificationism, Popper, 1979). Only in psychology do the first theorems related to debating the nature of metacognition appear.

Studies on the capability to gain conscious insight into one's thinking processes are a domain of psychology and do not have a very long history (Flavell, 1979: "cognition of one's cognition", Efklides, 2008: metacognitive experiences, Koriat, 2000: metamemory). Speculations on metacognition indicate its considerable importance in decision-making metaability, forming and changing attitudes, achievings long-term objectives (See, Petty, & Fabrigar, 2008). The specific insight into one's own behaviour plays an exceptional

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role. However this conscious and accurate insight into biases manifested in one's own behaviour is uncommon (Brycz, 2011) and can be a means of evoking a distance towards oneself, and consequently—a greater ability to self-regulate (Baumeister & Vohs, 2000). To know how each psychological bias demonstrated in the literature is displayed in one's behaviour, is the criterion of perceiving oneself accurately. For example, a bias called *the illusion of control* (Langer, 1975) consists in a deceptive confidence that our influence on the often random real-life events (such as winning a lottery) is greater than it actually is. Every bias (deviation from rational thinking in everyday situations) is in fact a certain statistical generalization. It is known, however, that most of people manifest that tendency. When a group large enough is asked to assess whether the given tendencies are or aren't expressed in their behaviours, one can expect to find individuals characterized by higher and lower accuracy of perceiving themselves in reference to the complex self-knowledge. The higher accuracy is probably related with the earlier conscious perception and the understanding of one's behaviours, with seeking sensible reasons for these behaviours and with building a kind of metaknowledge concerning the manifested biases (the effect of the process described requires earlier reinterpretation and self-awareness, Gazzaniga, 1989). It is the knowledge about one's knowledge on the subject of biases in one's own behaviour. We call such megaknowledge metacognitive self (MCS). In other words MCS is self-awareness of biases. The literature dedicated to the development and the influence of self-knowledge on our thoughts and feelings, although rich (Markus, 1980; Sedikides et al.; 2003, 2007, 2015; Dweck, 2000; Sarafino, 2011; Lerner & Clayton, 2011), lacks the consideration of metacognitive self viewed as gaining the accurate insight into one's own biases and psychological rules. This formulation will allow to extend our understanding of how self-metaknowledge translates into the ability to self-regulate.

We do not prejudge, however whether this self-metaknowledge is available in the cognitive system or it is automated (Bargh, Chen, & Burrows, 1996). We do think, however, that metaknowledge of one's biases (knowing that the self is sometimes unreasonable in its actions) bears a variety of important implications for human performance. For example, creating accurate self-metaknowledge could have been the effect of a general inclination to pursuit consistent goals more often than contradictory goals. The advantage of the analytical style over the heuristic style in evaluating oneself can be transferred into adaptive decision-making (an example of this would be to give up on the wish to buy a brand-name tablet as I need to save money for a flat). Likewise, a more accurate diagnosis of oneself can cause people to better allocate their efforts. That is to plan the accomplishment of their tasks in such a way as to obtain the desired effect—while knowing one's own limitations in terms of strategic goal allocation (Fishbach, Friedman, & Kruglanski, 2003; Kruglanski, Chernikova, Babush, Dugas, & Schumpke, 2015).

To sum up our reasoning we can say that MCS depends on motivation to achieve accurate self-awareness of biases, it is focused on the self, and helps to attain reasonable goals. What's more MCS is moderated by the perceived ability to achieve cognitive structuring, meaning more piecemeal reasoning (Bar-Tal, Brycz, Dolinska, & Dolinski, 2018).

MCSQ-24—Measuring Metacognitive Self

To measure metaknowledge, understood this way, a preliminary version of the Metacognitive Self Scale (MCSQ-40) was developed (Brycz & Karasiewicz, 2011). The scale comprises 40 items, each presenting a bias in the form of episodic behaviour (deviations from rational thinking, Nisbett & Ross, 1980; Kahneman & Tversky, 1973). Respondents answer on a continuous scale, ranging from 0% “this does not describe me at all”

to 100% “it describes me completely” (the scales should be 10 cm in length). Below we give examples of the items from the currently used version of the scale:

6. I tend to judge other people positively rather than negatively (positivity bias—the participants were not provided with this information).

0%-----100%

20. TV commercials really influence my choices and I buy advertised products more often (mere-exposure effect).

0%-----100%

15. If something or someone from the outside forces me to change my behaviour, my views concerning this behaviour also change (forced conformity).

0%-----100%

The MCSQ-40 scale used in studies to date is characterized by acceptable reliability and validity. The preliminary version of the scale is absolutely new and it was constructed a new version of the MCSQ-24, employing a Likert-type response format instead of the continuous response scale ranging from 0% to 100% (Brycz & Konarski, 2016). The questionnaire validated on nationwide sample ($N = 1,204$) appeared to be shorter. Moreover, convergent and concurrent validity of MCSQ-24 (nationwide sample $N = 600$) showed that metacognitive self is the self-regulatory, positive insight correlated with other positive metacognitive scales (e.g. Beer & Moneta, 2010), in opposite to unhealthy insight (Wells & Cartwright-Hatton, 2004; Table 1).

Table 1

Correlations Between MCSQ-24 and Adaptive vs. Maladaptive Metacognitive Measures

	MCSQ-24
Self-knowledge scale (Ghorbani, Watson, & Hargis, 2008)	0.31**
Postive metacognition (Beer & Moneta, 2010)	0.457**
Unhealthy insight (MCQ-30, Wells & Cartwright-Hatton, 2004)	-0.12

Note. ** $p < 0.01$ ($N = 600$).

Study 1. MCS and Goal Pursuit

To successfully attain the goal people have to decide upon which of their wishes they want to act. The decision shall be followed by elaborated plans, specific if-then plans (the mindset theory, Gollwitzer, 1999), the so-called implementation intentions, and mental contrasting (Oettingen & Gollwitzer, 2010). The following study is focused on preliminary stages of goal attainment (decision and plans). Based on the theory of plans and goals and MCS we postulated hypothesis:

H1. High MCS relates to avoiding conflicting goals and approaching compatible goals;

H2. High MCS relates to a greater number of actions undertaken to achieve goals;

H3 High MCS relates to greater number of specific plans (relations between means and goals, Kruglanski et al., 2015) that allow a person to achieve their goals.

Subjects and procedure. One hundred and eighteen (118) undergraduate students (67 female, 51 male), aged 22-40 ($M = 30.2$, $SD = 4.65$) were randomly assigned to the study. Participants validate their five most

important goals, specific actions and plans; and then filled in the MCSQ-24. Studies were approved by Ethical Committee.

Variables. As independent variable served averaged score of MCSQ-24, dependent variables were:

- Number of conflicting goals;
- Number of compatible goals;
- Number of past actions towards goals (30 past days);
- Number of specific plans (within next 30 days).

Results. We applied linear regression in order to answer our hypothesis. All predictions appeared to be valid. We hypothesized that the higher MCS the less conflicting goals participants mentioned : $\beta = -0.223$, $p < 0.03$, $R^2 = 0.05$, $t(83) = 2.19$; and more compatible goals they had in mind: $\beta = 0.203$, $p < 0.003$, $t(100) = -3.124$, $R^2 = 0.41$. Strong metacognitive self fosters better mental order of plans and actions undertaken to realize the goals.

Index 1 was created to show the difference between the amount of compatible goals—vs. conflicting goals. The index was counted via subtracting conflicting goals from compatible goals. For index 1, $t(100) = -3.34$, $p = 0.001$ (Figure 1).

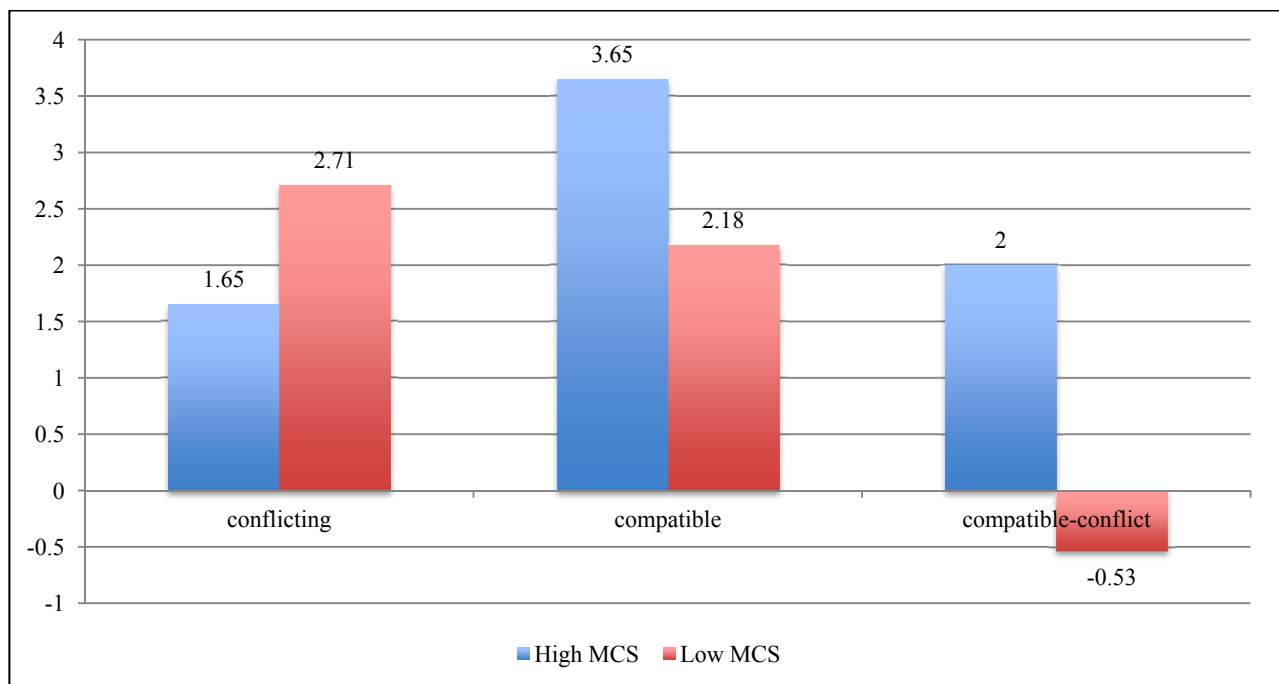


Figure 1. MCS and conflicting vs. compatible goals.

Plans and behaviors. Although high MCS and low MCS participants plan the same number of actions to fulfill their goals $\beta = 0.109$, $R^2 = 0.05$, $t(100) = -1.72$, high MCS students undertook more action in order to realize their goals $\beta = -0.237$, $p < 0.002$, $R^2 = 0.06$, $t(100) = -3.29$ (Figure 2).

Discussion. High MCS individuals prefer to organize their actions around compatible goals. Moreover they avoid creating conflicting goals in their mindset. What is also important however high MCS participants plan for further actions in the same way as low MCS, but high MCS undertook more actions to fulfill their goals (implemental mindset).

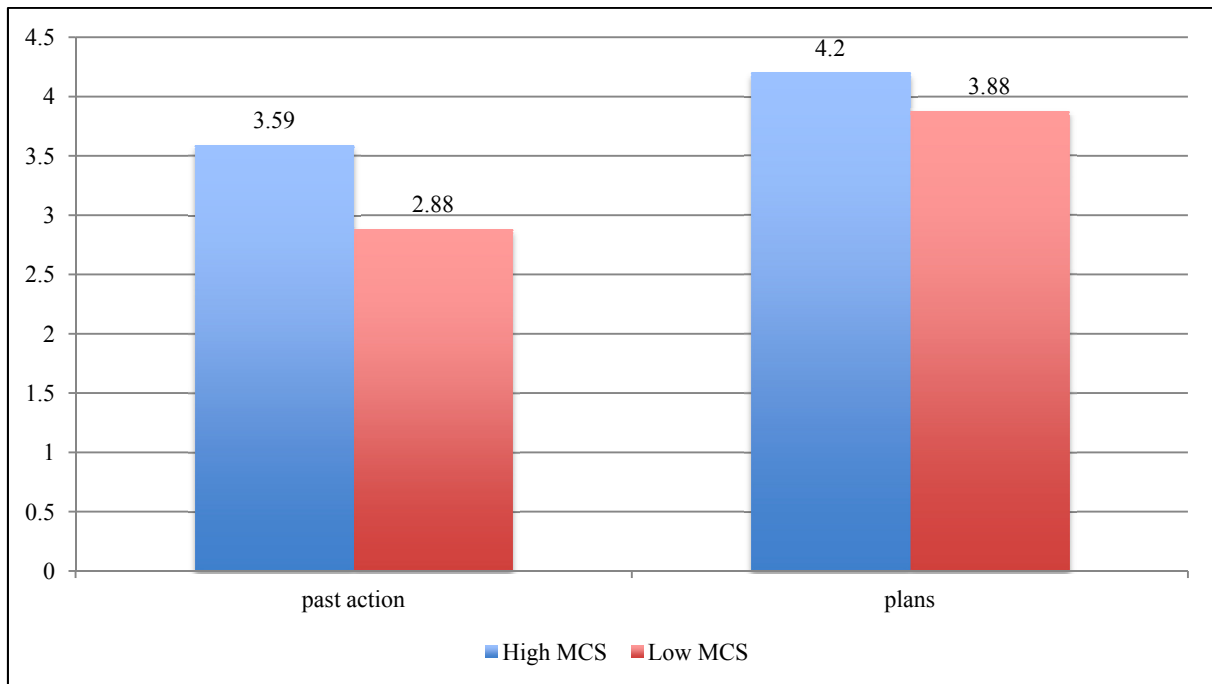


Figure 2. Plans and past actions among high MCS vs. low MCS.

Study 2. The Role of MCS for Past Actions Undertook to Obtain the Plan, and for Imagining Plans

Theory. Thanks to intrinsic motivation people find an activity itself enjoyable, their behavior is motivated by satisfaction. On contrary, extrinsic motivation triggers activity in an attempt to achieve some consequences: to gain a reward or avoid punishment. Positive feedback as well as support for people's autonomy enhances intrinsic motivation (the cognitive evaluation theory; Deci & Ryan, 2000). The organismic integration theory suggests that internalized regulation is assimilated with the sense of self (enhances intrinsic motivation). The Basic Needs Theory implies the importance of needs for autonomy, competence and relatedness as the for student's autonomous self-regulation (Jang, Reever, Ryan, & Kim, 2009). It is supposed that high MCS students employ more a deliberate self-theory, and their need for autonomy is more vivid than in low MCS individuals. The fear of punishment (emotional load) may impair internalized autonomous self-regulation of high MCS students resulting in poorer performance and goal pursuit.

Hypothesis. The assumption was that the interaction between MCS \times emotional load (according to task difficulty) explains dependent measures: index of performance and subjectively weighted index of performance. The hypothesis predicted that high MCS would work better in autonomy conditions (no load), as opposed to low MCS.

Subjects. Two hundred and one (201) undergraduate students (113 women and 88 men), aged 17 to 48 years, $M = 21.98$, $SD = 5.19$ were recruited randomly at the University campus. Studies were approved by Ethical Committee.

Procedure and variables. Participants worked individually. When participants came into the lab, they were asked to fill in the MCSQ-24 and Mood & Emotion Scale (Wojciszke & Baryła, 2005), then they were randomly assigned to experimental conditions: emotional load (they were told that the task is highly correlated with cognitive abilities and space-motion coordination, professor and her assistance would also stand behind a participant observing her/his work and demonstrated measuring time via an iPhone app) vs. no load

(participants were allowed to enjoy the task in the same lab, peacefully, in the presence of a young assistant sitting in the corner, the participants did not know time was being measured (the iPhone was hidden from their view). The other manipulation was task difficulty: participants were randomly assigned to difficult task (solving a puzzle with 222 pieces) vs. easy task (solving a puzzle with 60 pieces). All of them were told that they were allowed to work on the task only for up to seven minutes. Before doing a puzzle the subjects were to evaluate the subjective task importance on a 7-point Likert scale ranging from 1: definitely not important to me at all to 7: definitely very important to me. After completing the task, participants were asked to fill in the Mood & Emotions Scale once more. They were thanked and fully debriefed at the end of the session.

Experimental design: 2 emotional load (present or not) \times 2 task (easy vs. difficult). MCS was the main independent variable. The dependent measure, index of performance, was derived from: the time spent on the task and the number of puzzles pieces properly put together and it was calculated as follows: one's individual time was divided by the maximum time—we obtained a measure of time whose value was between 0 and 1; one's individual number of elements were divided by maximal amount of elements—we obtained a measure of elements whose value was between 0 and 1; it was then mathematically correct to sum both indicators of task performance, the operation created index of performance (IP). The other dependent measure was the subjectively weighted index of performance (SWIP). This dependent variable was calculated as follows: each subjectively assessed importance was divided by the standard deviation for each participant (importance corrected for variance) and multiplied by the index of performance (Newcom et al., 1981).

Repeated measures of mood and emotions (anger, sadness, guilt, fear, happiness, love) served to check the effectiveness of manipulation.

Manipulation check. Repeated analysis of variance for mood (before, after the task) acting as the intragroup variable and emotional load as the intergroup variable revealed significant group effect (emotional load vs. no load) $F = 10.93, p = 0.001$; mood in the emotional load group was significantly lower $M = 3.84, SD = 0.73$ than in the no load group $M = 4.19, SD = 0.83, t(199) = -3.069, p = 0.002$. The same effects appeared for fear-group, $F = 11.82, p = 0.001$: $M/load = 3.0$ vs. $M/no\ load = 2.36, t(199) = 3.41, p = 0.001$, and for happiness-group: $F = 18.12, p = 0.000$; $M/load = 4.72$ vs. $M/no\ load = 5.38; t(199) = -4.37, p = 0.000$. No other effect was present for emotions. Manipulation of emotional load affected the mood and the level of fear, as well as the level of happiness. Love, anger, guilt, and sadness weren't affected by the manipulation (Figure 3).

Results. Hierarchical regression performed separately for 2 (easy and difficult task) and 2 (emotional load vs. no load) on elaborated indicator of task performance showed the following effects: Table 2.

In other words, the interaction between emotional load and metacognitive self for index of performance was significant: $\beta = -1.05, t = 2.0, p = 0.05$ (Figure 4).

The interpretation of this result is in keeping with Deci and Ryan's self-determination theory (2000) and the theory of metacognition. High metacognitive tendencies towards self foster current motivation in the context of autonomy. High MCS people under observation perform poorer ($M = 1.43$) as opposed to low MCS individuals who perform better ($M = 1.55, t = 1.55, p = 0.056$) in case of the easy task. What's more, low MCS individuals need supervision to work better ($M/no\ load = 1.38$ vs. $M/load = 1.55, t = 1.57, p = 0.51$). While solving difficult task, participants differed in respect to MCS levels and their reaction towards the load. Whereas low MCS people perform identically despite the load, high MCS performed poorer when loaded.

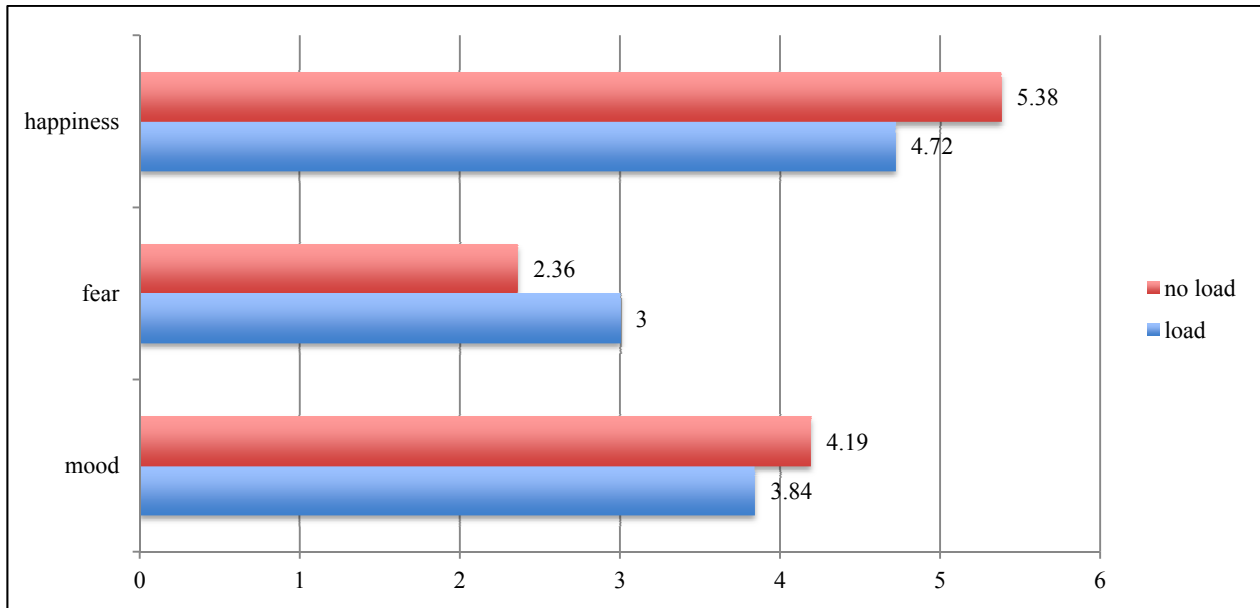


Figure 3. The impact of emotional load on mood and emotions.

Table 2

The Impact of Metacognitive Self on Index of Performance With Regard to Task Type and Load vs. No Load Manipulation

Difficult task	β	t	Sig.
Load	-0.23	-2.0	0.05
No load	-0.11	-0.80	0.43
Easy task			
Load	-0.29	-2.14	0.038
No load	0.17	1.22	0.23

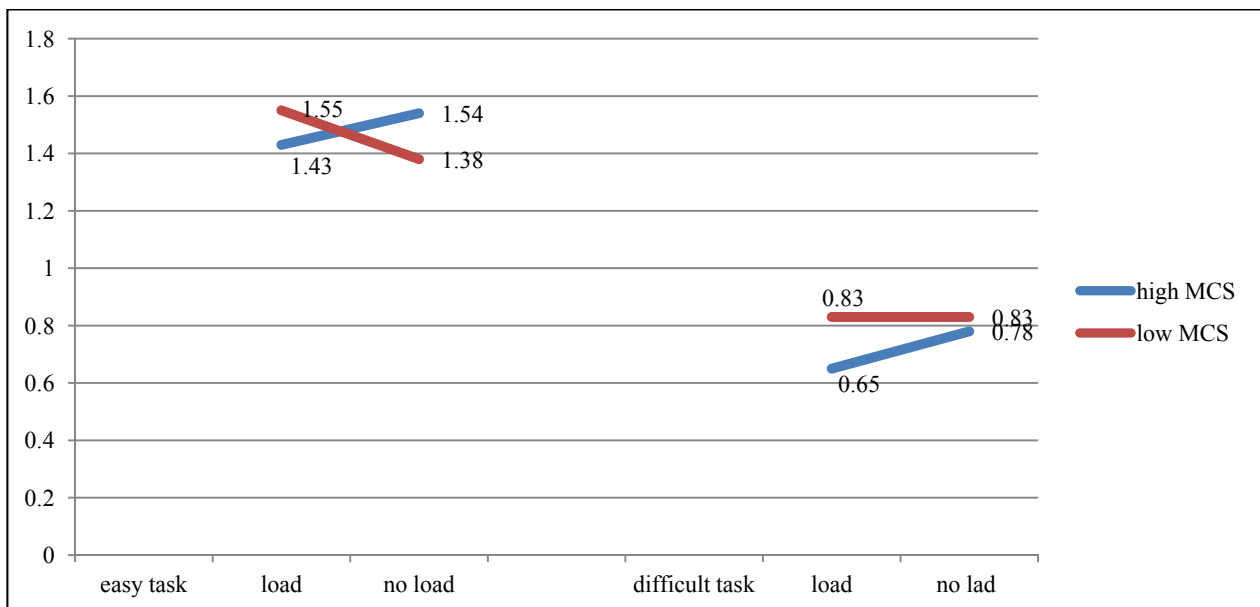


Figure 4. Interaction between load and metacognitive self for index of task performance.

The analogous regression performed for the subjectively weighted index of performance revealed a similar pattern. The interaction between the load and metacognitive self appeared to be significant $\beta = -1.52$, $t = -2.45$, $p = 0.015$. The main effect of the experiment was not significant $\beta = -0.17$, $t = -0.28$, n.s. (Figure 5).

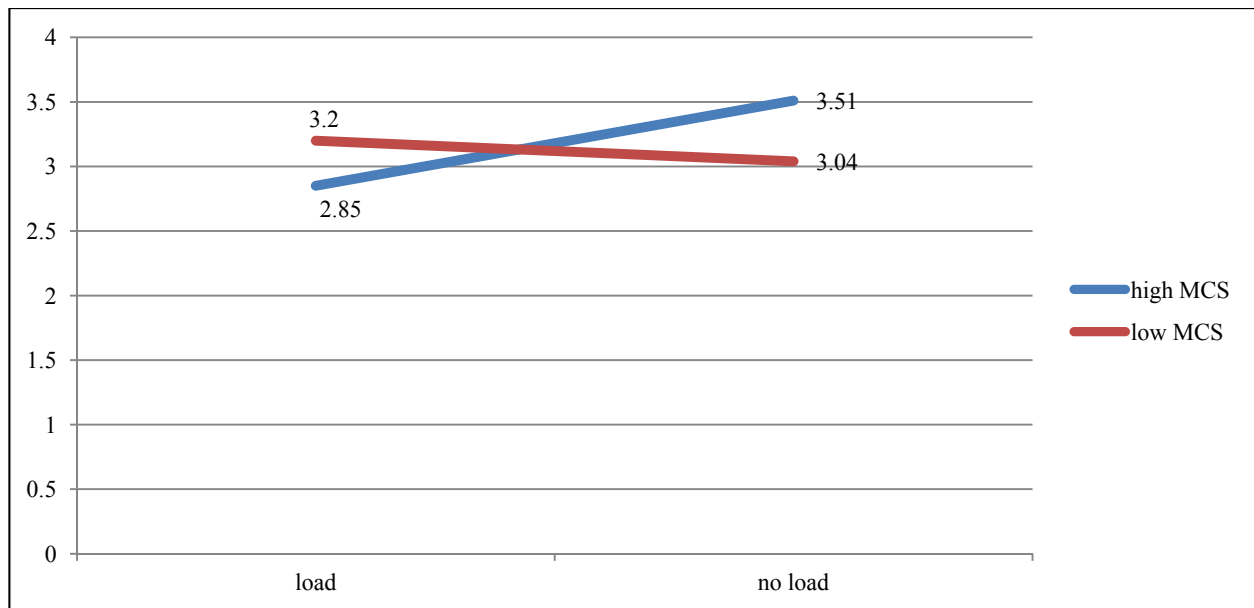


Figure 5. Interaction between load and MCS for subjectively weighted index of performance.

As indicated by Figure 5, high MCS participants not only performed better without the load, and their index of performance corrected for their subjective value of the goal appeared to be significantly higher than in case of the load conditions. The result is contrary to the one obtained for low MCS individuals.

Discussion

As predicted, good insight into one's own biases enhances self-regulation in the field of making decisions on specific plans and goals. The latter is in line with the implemental mindset theory elaborated by Gollwitzer (1999). Moreover, high metacognitive self individuals strive for autonomy and they work much better to attain their goals in the no load settings, while low metacognitive students work much better under supervision. The latter is in line with Deci and Ryan's theory (2000).

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