

Metacognitive Awareness in the Structure of Mental Self-Regulation in Students Involved and not Involved in Sports

Aleksandra Lovyagina

*Department of General Psychology
St. Petersburg State University
St. Petersburg, Russia
0000-0001-6120-1808*

Stepan Mednikov

*Department of General Psychology
St. Petersburg State University
St. Petersburg, Russia
0000-0002-6493-5775*

Valentine Byzova

*Department of General Psychology
St. Petersburg State University
St. Petersburg, Russia
0000-0001-6362-7714*

Anton Schukin

*Developmental and Differential
Psychology Department
St. Petersburg State University
St. Petersburg, Russia
0000-0003-3312-2488*

Helena Khvatskaya

*Department of Psychology
Lesgafi National State University of
Physical Education, Sport and Health
St. Petersburg, Russia
0000-0002-7757-5182*

Abstract—The article presents the results of a comparative analysis of the relationship of metacognitive involvement and the characteristics of the conscious self-regulation style and volitional processes in students involved and not involved in sports. Common relationship between the severity of metacognitive awareness, the formation of programming and the general level of conscious self-regulation for men and women involved and not involved in sports have been identified. It has been established that in athletes of both sexes, metacognitive awareness is more closely connected with the characteristics of the style of conscious self-regulation, as well as connected with volitional regulation in case of failures.

Keywords—*metacognitive awareness, conscious self-regulation style, volition, students, athletes*

I. INTRODUCTION

The ability of self-regulation is one of the main characteristics of the human psyche [1]. Mental self-regulation is considered as a complex integral system, which functioning is connected with the actualization of various spheres of the psyche: cognitive, motivational, emotional, volitional [2, 3]. For a long time the analytical approach has dominated in the sphere of mental self-regulation studies. Separate manifestations of self-regulation are studied: the development of general volitional regulation in ontogenesis, emotions control for mental state changes, etc. With the accumulation of scientific knowledge, there is a tendency to study mental self-regulation along the synthetic approach, which allows to form scientific ideas about the integral mechanisms of mental activity regulation. The synthetic which allows to form scientific ideas about the integral mechanisms of mental activity regulation. The synthetic approach made it possible to identify the system of functional units of self-regulation [4], the characteristics of an individual style of self-regulation [5], and metacognitive processes [6].

In modern psychology, special attention is paid to researches of the metacognitive processes role in the effectiveness of mental self-regulation. Metacognitions are defined as a set of human knowledge about their cognitive processes and skills in order to control them [7]. In the process of performing a specific activity (educational, professional) a person can control his cognitive processes with various degrees of awareness. Accordingly, metacognitive processes can be included in activities with different intensity. The manifestation of knowledge and skills aimed at the awareness and organization of cognitive processes during activities is characterized as metacognitive awareness [8]. The actualization of metacognitive processes makes it possible to optimize cognitive processes in accordance to the activity goals. In each particular situation, a certain system of mental self-regulation is formed to achieve these goals. With low metacognitive awareness, a person is poorly aware of the strengths and weaknesses of his thinking, finds it difficult to increase the memory effectiveness, does not know how to manage attention, etc. A high level of metacognitive awareness allows one to be aware of mental operations, adequately evaluate them, manage concentration of attention, etc. The fact that increasing the level of metacognitive awareness helps to improve learning and increase the productivity of intellectual activity has been demonstrated [9, 10].

According to research results, the effectiveness of mental self-regulation increases with mastering skills in various activities: educational, motor, labor [11,12]. However, the relationship between the development level of metacognitive processes and the features of the mental self-regulation structure is not sufficiently specified. In particular, it is not quite clear how the level of metacognitive awareness is reflected in the severity of the characteristics of the conscious self-regulation style (regulatory processes and personality-regulatory properties). The relations between metacognitions and

volitional processes are interpreted ambiguously [10,13]. The deficiency of information about the relations between metacognitive awareness and regulatory and volitional processes does not allow effectively improving the holistic system of mental self-regulation and using it as a meta-resource to achieve educational and professional goals [2].

The purpose of this research is studying the relationship between indicators of metacognitive inclusion and characteristics of mental self-regulation (conscious self-regulation style and volitional processes). This relationship may be specific to a particular activity or may be common to different activities. In order to identify the common to different types of activities relationships, a comparative analysis was conducted, between the indicators of metacognitive awareness and the characteristics of mental self-regulation among students mastering one type of activity — educational and two types — educational and sports.

II. MATERIALS AND METHODS

A. Sample

The study involved 339 university students from St. Petersburg (Russia) aged 19–22 years old: male not involved in sports (78 people), male athletes (83 people); female not involved in sports (92 people); female athletes (86 people). All students studied at 2-3 bachelor's years in the following specialties: psychology, pedagogy, biology. There were no non-sportsmen students who combined their studies with work or were seriously engaged in dancing, music, other forms of art. Students-athletes engaged in the following sports: athletics (14%), swimming (12%), football (15%), volleyball (13%), sports aerobics (13%), dance sports (13%), powerlifting (11%), and sailing (9%). Experience in sports varied from 3 to 8 years. All students-athletes were involved in sports to continue their sports career: they set goals to improve their results, trained 4-6 times a week, went to training camps and performed at competitions regularly.

B. Methods

For diagnostics of the metacognitive awareness of students, a questionnaire Metacognitive Awareness Inventory (G. Schraw, R.S. Dennison), Russian version A.V. Karpov [10] was used. Characteristics of mental self-regulation of students were diagnosed by questionnaires: Style of Self-Regulation Behavior (by V.I. Morosanova), Action Control Scale (J. Kuhl), Russian version of the German HAKEMP-90 by S.A. Shapkin [5, 14].

C. Procedure

A survey of all students was conducted in February-March 2019 during the normal educational process, 2-3 months before the attestation period (tests and exams). During the survey, student-athletes had a normal training regime; there were no high physical and mental stress associated with preparing for a competition. During the survey, all students completed the questionnaires in the

same sequence: Metacognitive Awareness Inventory, Style of Self-Regulation Behavior, and Action Control Scale.

III. RESULTS AND DISCUSSION

A. The Level of Metacognitive Awareness

The metacognitive awareness of male students on average corresponds to an elevated level: those not involved in sports (201.31 ± 3.12); athletes (195.61 ± 5.01), according to Student's criterion, there were no statistically significant differences. In female students, metacognitive awareness also corresponds on average to an elevated level: not involved in sports (194.91 ± 2.17); athletes (189.34 ± 3.31), no statistically significant differences were detected (Student's criterion). Thus, in metacognitive awareness, student-athletes (male and female) are no different from students not involved in sports (male and female).

B. Metacognitive Awareness and Regulatory Processes

For male students who are not involved in sports, increasing the metacognitive awareness level is connected with improved programming and a general conscious self-regulation level (Table 1). In student-athletes, an increase in the metacognitive awareness level is interrelated not only with these indicators, but also with planning and modeling (Table 1). Thus, for students not involved in sports, improving the management of their cognitive processes (metacognitive awareness) is connected only with improving the reasonableness of the sequence of actions to achieve the goal (programming). While in students involved in sports with increase of cognitive sphere management, regulation improves: setting goals for activities (planning), highlighting conditions that are important to achieve a goal (modeling), developing a sequence of actions to achieve a goal (programming). Similar relationships were found in female students (Table 2). But in the group of female not involved in sports, as opposed to male, the increase in metacognitive awareness is connected with the improvement of conscious planning of activities (Table 2). And for female athletes, in contrast to male, the increase in metacognitive inclusion is connected with an improvement of the regulatory processes flexibility. The demonstrated relationships show that the metacognitive processes and characteristics of self-regulation style are more structured for female students than for male. It should be noted that no statistically significant differences in metacognitive awareness between male and female students were found. Similar results on the absence of differences in the severity of metacognitive awareness in male and female students are described in other studies [15]. At the same time, according to traditional stereotypes, girls are more organized and disciplined than boys. Perhaps a more successful self-organization of activity and behavior is provided through closer interrelations between metacognitive awareness and characteristics of self-regulation style. However, additional studies are needed to test this idea.

TABLE 1. RELATIONSHIPS BETWEEN INDICATORS OF METACOGNITIVE AWARENESS AND REGULATORY PROCESSES FOR MALE STUDENTS (CORRELATION ANALYSIS, PEARSON TEST)

Self-control style rates	Metacognitive Awareness	
	Non-sports students (n = 78)	Student athletes (n = 83)
Planning	Not significant	r = 0,254 p ≤ 0,05
Modeling	Not significant	r = 0,236 p ≤ 0,05
Programming	r = 0,237 p ≤ 0,05	r = 0,268 p ≤ 0,05
Result rating	Not significant	Not significant
Flexibility	Not significant	Not significant
Self-reliance	Not significant	Not significant
Overall self-control	r = 0,241 p ≤ 0,05	r = 0,301 p ≤ 0,01

TABLE 2. RELATIONSHIPS BETWEEN INDICATORS OF METACOGNITIVE AWARENESS AND REGULATORY PROCESSES FOR FEMALE STUDENTS (CORRELATION ANALYSIS, PEARSON TEST)

Self-control style rates	Metacognitive Awareness	
	Non-sports students (n = 92)	Student athletes (n = 86)
Planning	r = 0,242 p ≤ 0,05	r = 0,230 p ≤ 0,05
Modeling	Not significant	r = 0,216 p ≤ 0,05
Programming	r = 0,229 p ≤ 0,05	r = 0,441 p ≤ 0,001
Result rating	Not significant	Not significant
Flexibility	Not significant	r = 0,263 p ≤ 0,05
Self-reliance	Not significant	Not significant
Overall self-control	r = 0,211 p ≤ 0,05	r = 0,435 p ≤ 0,001

In all participants groups (regardless of gender and sport activity), an increase in the metacognitive awareness level is connected with improved programming and an increase in the conscious self-regulation level. These results are consistent with the scientific understanding of the formation of a mental voluntary regulation [3, 16]. Increased metacognitive awareness allows students to control cognitive processes more consciously. Improving self-awareness with attention, memory, thinking contributes to more accurate processing of information about the conditions of activity and person capabilities as a subject of activity. This leads to the choice of more adequate methods of action and their sequence.

Compared to non-athletes, in athletes (both male and female), metacognitive awareness is more closely related to the characteristics of the conscious self-regulation style. Students involved in sports, in addition to intellectual tasks,

endure exercise and competitive stress. Since they combine the development of the undergraduate study and active sports, they need to be able to organize themselves and comply with the regime.

Students-athletes set goals to achieve certain academic and sport results. At this stage of life, they are trying to realize their potential in two types of activities — to make a double career [17].

Mental self-regulation of student-athletes varies from those who are not involved into professional sport. The difference lies in implementation of both remote in time and close situational goals. The implementation of distant goals (for example, obtaining a bachelor's degree or the inclusion in the national sport team) requires the skills of long-term planning of educational and sports activities. Athletes must evaluate their abilities, compare them with their intended goals and determine the direction of their professional and personal development. Achieving close situational goals (for example, preparing an essay or performing exercises in training) requires the ability to mobilize in a particular situation and make decisions about how to implement the activity. Thus, a double career increases the requirements for mental self-regulation on two levels: long-term regulation, aimed at achieving remote goals and situational regulation.

More complex requirements for mental self-regulation of student-athletes stimulate the interdependent development of skills to manage their cognitive sphere and voluntary activity. Therefore, in athletes, the level of development of their cognitive processes management skills is connected with individual differences in the formation of almost all regulatory processes: goal setting, creating conditions that is relevant to goal achieving; development of action programs to achieve the goal.

It should be noted that the assessment of the activities results is not connected with metacognitive awareness in all participants groups. Obviously, the reason is that the motivational and value-semantic areas are actively involved in the assessment process. It is these areas (but not metacognition) that predetermine the evaluation aspects.

C. Metacognitive Awareness and Volitional Processes

A comparative analysis of the relationship between the metacognitive awareness level and the severity of volitional processes showed that only among students-athletes an increase in the level of metacognitive awareness is connected with improved control over the action upon failure (Table 3). In the group of students (male and female) who are not involved in sports, no statistically significant relationship between metacognitive awareness and characteristics of volitional control has been detected.

TABLE 3. RELATIONSHIPS BETWEEN INDICATORS OF METACOGNITIVE AWARENESS AND VOLITIONAL PROCESSES FOR STUDENTS ATHLETES (CORRELATION ANALYSIS, PEARSON TEST)

Action Control Scale	Metacognitive Awareness	
	Men (n = 83)	Women (n = 86)
Planning process control rate	Not significant	Not significant
Implementation process control rate	Not significant	Not significant
Post-failure process control rate	r = 0, 314 p ≤ 0,05	r = 0, 227 p ≤ 0,05

Both students involved and not involved in sports will certainly face failures in their lives. In addition to the typical student problems associated with studies and personal relationships, athletes may experience failures during training and competitions: the inability to master new movements, defeats at competitions, stagnation of results, injuries, etc. Athletes not only often experience failures, but also actively cope with them in order to continue a career in sports [18]. It can be assumed, that more frequent overcoming of failures reinforces the connection between metacognitive skills and volitional qualities: perseverance, endurance, self-control. Thus, the control and management of attention, memory, and thinking is crowded out the experiences accompanying failures highlight the intention to implement the activity that is necessary in this situation.

IV. CONCLUSION

The results of the study revealed the common for the mental regulation of educational and sports activities relations between the level of metacognitive awareness and the quality of regulation of action programs with which the goal will be achieved. The relations between the metacognitive awareness level and the general level of voluntary activity, conscious self-regulation were also common for the mental regulation of educational and sports activities. The actualization of these relationships provides the coordinated management of the cognitive sphere and voluntary activity. Thus, structural and functional structures are formed, which can be considered as universal regulatory resources [2].

Increasing the requirements for mental regulation of students (the need not only in learning development, but also in sports) contributes to the formation of closer relationships between metacognitive awareness and regulatory processes (planning, modeling, programming). These data suggest that the systematic actualization of self-regulation skills in more difficult conditions reinforces the integration of mental activity regulating mechanisms.

Due to the higher requirements for mental regulation associated with sports activities, male and female students

form relations between metacognitive awareness. and volitional regulation in case of failures. The complexity of self-regulation conditions, which is sport activity characteristic, leads to the need for a lot of psychological work with emotions. In a sports career, an athlete gains the skills of experiencing failures (defeats at competitions, injuries, excess weight, etc.). It is important that the athlete should use the skills of experiencing failures on a regular basis: in the training process, during competitions, and in lifestyle regiment. Regular actualization of experience skills stimulates the improvement of metacognition. In turn, more efficient management of their cognitive processes allows athletes to better understand the meaning of failures and to form a more adequate attitude. Thus, coordinated regulation of cognitive and emotional-volitional processes contributes to the adaptation of student-athletes to more complex conditions of activity and to a more difficult lifestyle regiment.

The results of the study prove that the role of metacognitive awareness in the structure of mental regulation is due to the peculiarities of activity. The combination of learning and sports activities imposes higher requirements on students' self-regulation skills. Improvement of self-management skills effectiveness is achieved through closer interrelations of metacognitive awareness with the characteristics of self-regulation style and volitional processes.

The results show that in order to improve the mental regulation of athletes, it is advisable to organize classes on the metacognitive awareness development in the process of their psychological training. For example, metacognitive trainings, psychotechnical games and exercises, etc. Similar classes can be conducted for students not involved in sports, in cases where they tend to act impulsively or cannot determine what, how and in what sequence to do to achieve the goal. The exercises to increase metacognitive awareness can include tasks for the development of awareness, analysis, evaluation and correction of cognitive processes. During exercises to develop the programming skills of their activities, students can analyze successful and unsuccessful programs of their actions, as well as develop programs for new activity goals and analyze them individually or as a group.

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