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# The impact to demographic and academic factors on metacognition and academic self-efficacy: A study on Iranian students in health sciences

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## Abstract:

**BACKGROUND:** Metacognition and academic self-efficacy are two emerging resources in the process of learning. Basic levels of metacognition and academic self-efficacy may differ and be influenced by demographic and academic factors. This study investigated impacts of demographic and academic factors on metacognition, metacognitive skills, and academic self-efficacy in health sciences students.

**MATERIALS AND METHODS:** A cross-sectional study was conducted among 404 participating students attending various fields of study in health sciences at Shahrekord University of Medical Sciences. Demographic and academic data were collected. Global metacognition, metacognitive skills, and academic self-efficacy scores were assessed using published or online questionnaires. Means were compared using Student's *t*-test, whereas intra- and intergroups' scores were compared using one-way ANOVA test.

**RESULTS:** Global metacognition and academic self-efficacy were not impacted by demographic students' status. The gender and age impacted both knowledge and control of process-planning (favoring male gender), as well knowledge and control-of-self (disfavoring 20–30 age class) of metacognitive skills, ( $P < 0.05$ ). Academic status did not influence academic self-efficacy. The school type influenced the metacognitive skill component to knowledge and control of process-regulation (disfavoring nursing school) ( $P < 0.05$ ). The academic discipline impacted the global metacognition ( $P < 0.05$ ) and its knowledge and control of self-component ( $P < 0.01$ ).

**CONCLUSIONS:** Demographic and academic status does impact metacognitive skills and global metacognition scores. Given the heterogeneous level to innate metacognitive skills, this study sheds lights on usefulness to screen learners' subgroups that require supplementary educational instructions to uniformly optimize metacognitive skills.

## Keywords:

Demography, learning, medical education, metacognition, self-efficacy

## Introduction

The scope of progression in the process of learning seeks insightful strategies to incur polished talent with the aim of conferring ability to achieve the expected educational goals. By the ongoing area, metacognition does play a salient role to candid learning process.<sup>[1]</sup> Metacognition

does afford instrument rating control to fix operational limits of classic cognitive resources in the field of ever-expanding education.<sup>[2]</sup> Recruiting and ordering metacognitive skills do sustain higher self-confidence and self-efficacy in the course of learning process.<sup>[3-6]</sup> By actively integrating metacognition in the learning strategies, grounded educational solutions

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are advanced: flourishing learning self-responsibility, awareness/recognition of personal learning requirements, and creative skills in conceiving/applying new learning pathways.<sup>[7,8]</sup> Identifying factors that may impact the basic level of metacognition and self-efficacy wears salient importance, by screening the suboptimal learners' subgroups. Acknowledging differences in innate learners' skills leads to explore in detail the compensatory educational strategies, useful to anticipate goal-directed learning.<sup>[9,10]</sup> Despite the ongoing investigations and interests on exploring metacognition among Iranian students,<sup>[11-15]</sup> yet, the comparative levels of metacognition and self-efficacy among students in health sciences belonging to various schools related to the University of Medical Sciences (UMS) as well as their relative impactors remain to be analyzed. The available literature provides conflictual information on the potential impact of students' demographic and academic status on metacognition and academic self-efficacy. By the present study, it was sought to investigate the impact of demographic and academic status on basic levels of global metacognition, metacognitive skills, and academic self-efficacy. The latter in view of identifying subgroups of students that may require further enhancing educational instructions. At our best knowledge, the available literature does not lead to such a comparable previous study.

## Materials and Methods

This study is a prospective cross-sectional investigation among students in health sciences to the Shahrekord UMS (SKUMS) undertaken during academic winter semester of 2018–2019. The sampling size was calculated with a 95% confidence level and 5% margin of error at, according to the following formula:

$$n = (z^2 p(1-p)) / d^2$$

Consequently, 404 participants among whole active students in various fields of study in health sciences were sampled. Stratified random sampling was resorted in order to select 404 students among different schools in various field of study. As doing so, the proportional percentage of students in regard to each of SKUMS schools was drawn. Participants were randomly sampled to each of related schools. The relative percentages to each of school participants were determined as follows: medicine 39%, dentistry 3%, allied medicine 16%, health 13%, and nursing 29%. Accordingly, the participant number in relation to each field of study and inside each school was proportionally estimated in respect to the student number of concerned school. The inclusion criteria were being active learner at SKUMS during the study period and being consent to participate in the study. Incompleteness in fulfilling adequately

questionnaires was considered as exclusion criteria from the study. In the latter case, the participant was replaced in accordance with the sampling method.

The global metacognition, metacognitive skills, and academic self-efficacy of each participant were assessed by determining their relative scores using questionnaires. The selected participants were informed and instructed to adequately implement questionnaires during organized collective audits at each related school, and prior to study enrollment. Questionnaires were assessed during scheduled time frames to each related school. Global metacognition and metacognitive skills were assessed by Karami questionnaire.<sup>[16]</sup> The latter assessed four metacognitive skills: Knowledge and Control of Self (Commitment, Attitudes, and Attention), Knowledge and Control of Process Planning, Knowledge and Control of Process Evaluation, and Knowledge and Control of Process Regulation. Karami questionnaire claims a validity of 98% and reliability of 94%.<sup>[16]</sup> The academic self-efficacy was assessed using Owen and Froman questionnaire with an assigned reliability to 91%.<sup>[17]</sup> The both questionnaires were answered in the same time frame by each participant. Each participant was interrogated at the ensuing school.

The obtained global metacognition, metacognitive skills, and academic self-efficacy scores were entered to SPSS software version 16 (SPSS Inc., Chicago, IL, USA) and descriptive statistics (the sums, frequency, percentage, means, and standard deviation) were calculated. Student's *t*-test was used to compare the means, and inter- and intragroups were compared using one-way ANOVA. The current study was approved by the institutional research deputyship, student research committee, and was registered under IR.SKUMS.REC.1396.163. Written consent was obtained from each participant before study enrollment.

## Results

Four hundred four students in various fields of health sciences and issued from five related schools that encompassed 14 academic disciplines and resulting in five academic degrees were included over a total of 2322 active students. The demographic data of participants are reported in Figure 1. The majority of participants (173) belonged to the age group of 20–30 years (50%) [Figure 1a], and 327 students were single as marital status (81%) [Figure 1b]. The frequencies of academic disciplines are reported in Figure 2c. Regarding the academic degrees, bachelors in health sciences represented the most prevalent (52%), followed by students in medical doctor degree (32%) [Figure 2b]. One hundred and fifty-eight of the students (39%) belonged to the

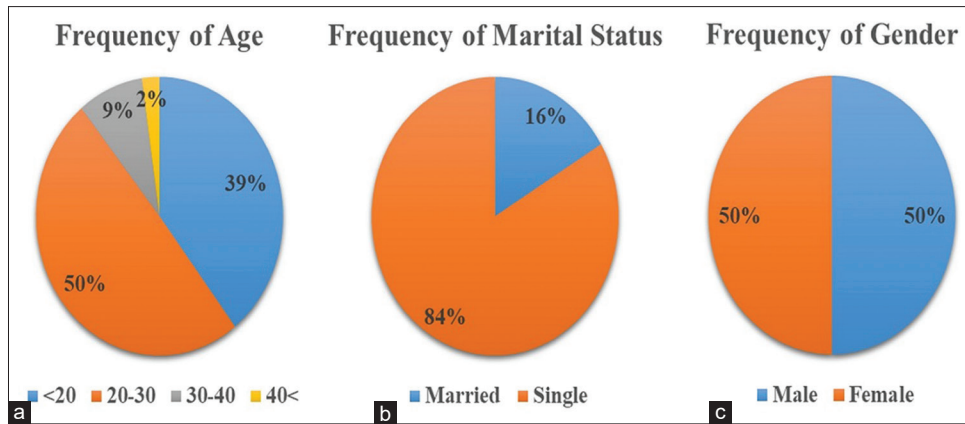


Figure 1: Distribution of participants' age (a), marital status (b), and gender (c) frequencies

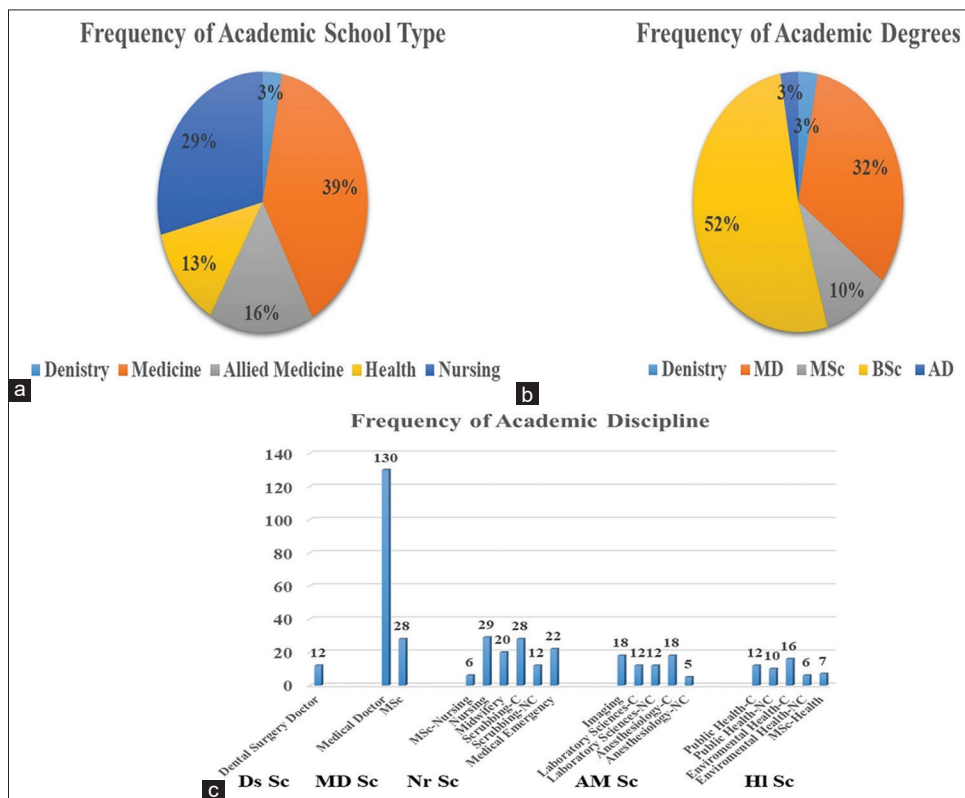


Figure 2: Distribution of academic school type (a), academic degree (b), and academic discipline per ensuing school (c). Ds Sc = Dentistry School, MD Sc = Medical School, Nr Sc = Nursing and Midwifery School, AM Sc = Allied Medicine School, HI Sc = Health School

medical school, and 117 students were selected from the nursing schools (29%) [Figure 2a].

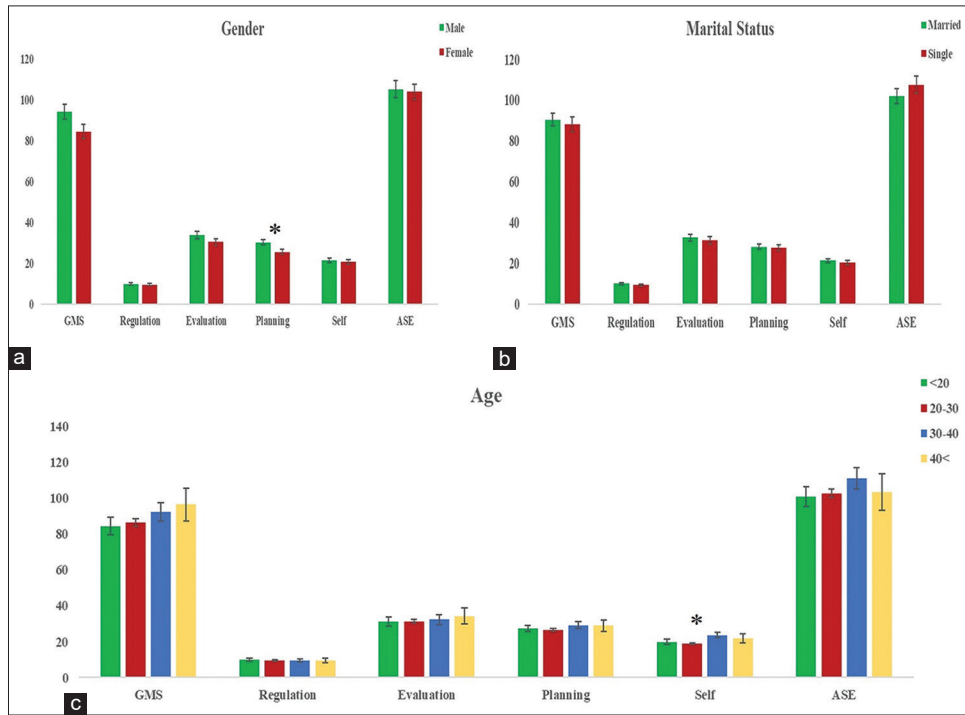
Concerning the impact of demographic status on metacognition, global metacognition scores did not differ significantly in respect to the students' gender [Figure 3a]. Among four metacognitive skills, just knowledge and control of process planning significantly differed among the male and female students favoring male gender ( $P = 0.03$ ). When it comes to the impact of the age [Figure 3c], only the knowledge and control of self (commitment, attitudes, and attention) showed

significant difference among the different age groups disfavoring age less than 30 years ( $P = 0.03$ ). The civil status did not influence the metacognitive skills. The demographic status did not impact academic self-efficacy [Figure 3b].

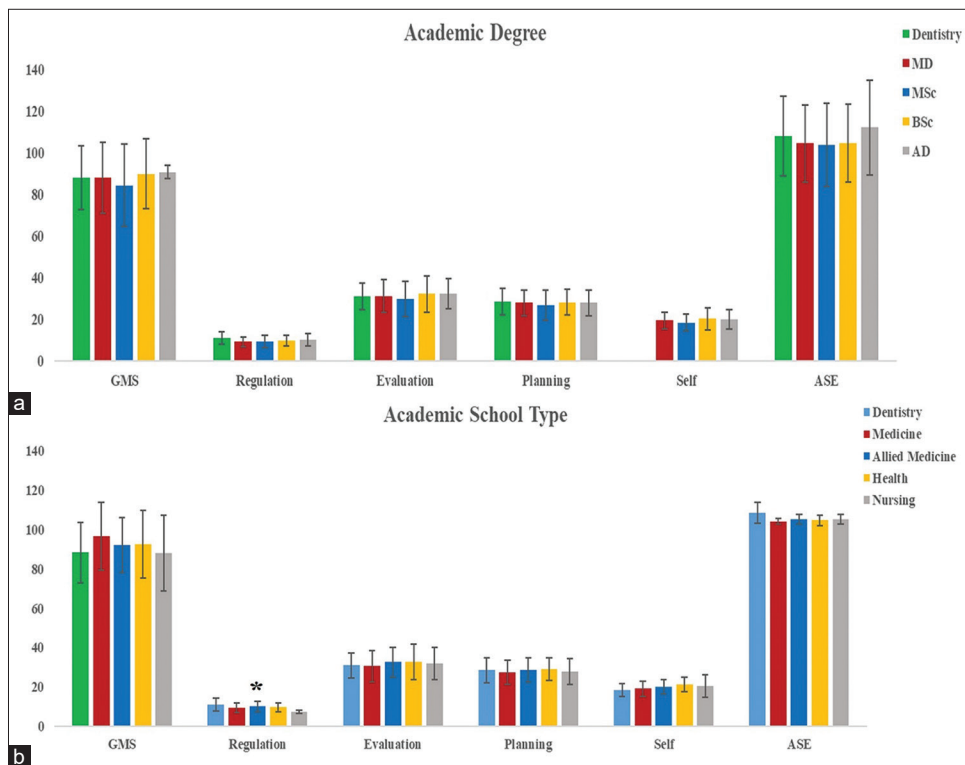
The impact of investigated academic status (academic discipline, academic degree, and school type) on metacognition and academic self-efficacy is reported in Figures 4-6. The academic degree did neither influenced metacognition, nor academic self-efficacy [Figure 4a]. Knowledge and control of process regulation was

the only metacognitive skill significantly impacted by the academic school type in disfavor of nursing

school ( $P = 0.02$ ) [Figure 4b]. The academic discipline significantly influenced global metacognition scores



**Figure 3:** Impact of demographic factors on global metacognition, metacognitive skills, and academic self-efficacy scores of medical sciences students: gender (a), marital status (b), and age (c)  $GMS =$  Global metacognition score, Regulation = Knowledge and control of process, Evaluation = Knowledge and control of process, Planning = Knowledge and control of process, Self = Knowledge and control of self-commitment, attitudes, and attention, ASE = Academic self-efficacy. Data are presented as mean  $\pm$  SD



**Figure 4:** Impact of academic factors on global metacognition, metacognitive skills, and academic self-efficacy scores of medical sciences students: academic degree (a) and academic school type (b).  $GMS =$  Global metacognition score, Regulation = knowledge and control of process, Evaluation = knowledge and control of process, Planning = knowledge and control of process, Self = knowledge and control of self-commitment, attitudes and attention, ASE = academic self-efficacy. Data are presented as mean  $\pm$  SD

between students groups ( $P = 0.04$ ) [Figure 5a], as well as impacting knowledge and control of self-metacognitive skill ( $P = 0.005$ ) [Figure 5b]. Similarly, to the influence of demographic status, academic self-efficacy was not impacted by students' academic status [Figure 5c].

### Discussion

Cognition is described as the principal resource to learning process.<sup>[18]</sup> Nevertheless, the cognitive process of learning displayed its limitations to meet ever-increasing requirements in educational efficiency.<sup>[2]</sup> Metacognition defined as the active control on cognitive skills, exhausts to reach the top-grade cognitive processing by incurring active awareness to enhance the self-monitoring skill, and conferring proactive educational empowerment.<sup>[10,11,19]</sup> Self-efficacy is defined as individual believes in one owns capacity as to set up appropriate mindset, regulating consequent behaviors.<sup>[20]</sup>

Taking in considerations the salient role of metacognition and self-efficacy in high rising learning, it is advised to assess their respective basic levels as to pragmatically conceive the content to educational resources and the optimal way to deploy appropriate instructional methods.<sup>[21]</sup> In line with the latter, the present study was conceived to investigate the impact of demographic (gender, age classes, and marital status) and academic (academic degrees, school type, and discipline) status on the basic levels of metacognition and academic

self-efficacy in a stratified random sampling among SKUMS students at various branches of health sciences.

The present results showed that global metacognition *per se* and academic self-efficacy were not influenced by the investigated demographic students' status. There are conflictual data in the available literature regarding the impact of demographic status in higher education, and the most available information targeted high school students. Oguz and Ataseven reported significant impact of gender on metacognition among higher education students.<sup>[22]</sup> In a study over 280 higher school students, Kaur did not find any significant impact of gender on the metacognition level.<sup>[23]</sup> The latter was confirmed by the study of Siswati and Corebima in Indonesian high school students.<sup>[24]</sup> Concerning the impact of gender on self-efficacy, Hekmat-Nejad and Safi-Khani reported no correlation among 200 students respecting gender equality,<sup>[12]</sup> paralleling the recent reported data of Tiyuri *et al.*, among postgraduate students upon research to self-efficacy.<sup>[13]</sup> The latter was in line with a meta-analysis undertaken by Husain that concluded on absence of any gender impact on self-efficacy.<sup>[25]</sup> In contrary, Eze *et al.* found that age and gender had significant impact on academic achievement in 117 Nigerian university students.<sup>[26]</sup> Mirdrikvand reported significant impacts of gender in academic achievement, favoring female sex, in Iranian students.<sup>[14]</sup> Amuda *et al.* did not find any influence of marital status on academic

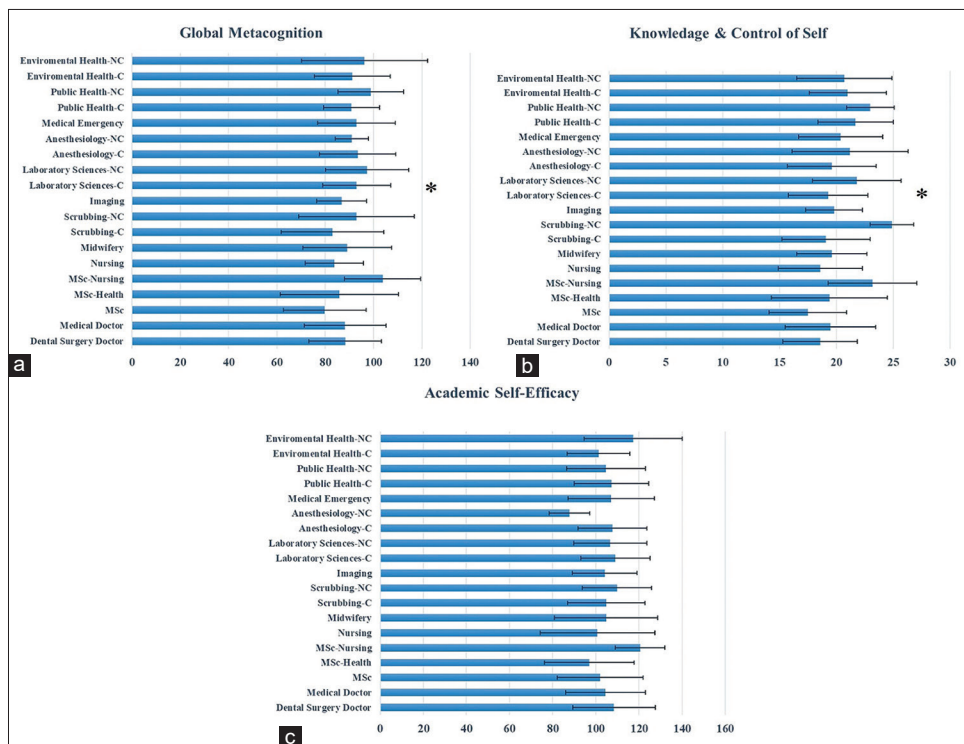


Figure 5: Impact of academic discipline as an academic factor on global metacognition, metacognitive skills, and academic self-efficacy scores of medical sciences students: global metacognition (a), knowledge and control of self (b), and academic self-efficacy (c). Data are presented as mean ± SD

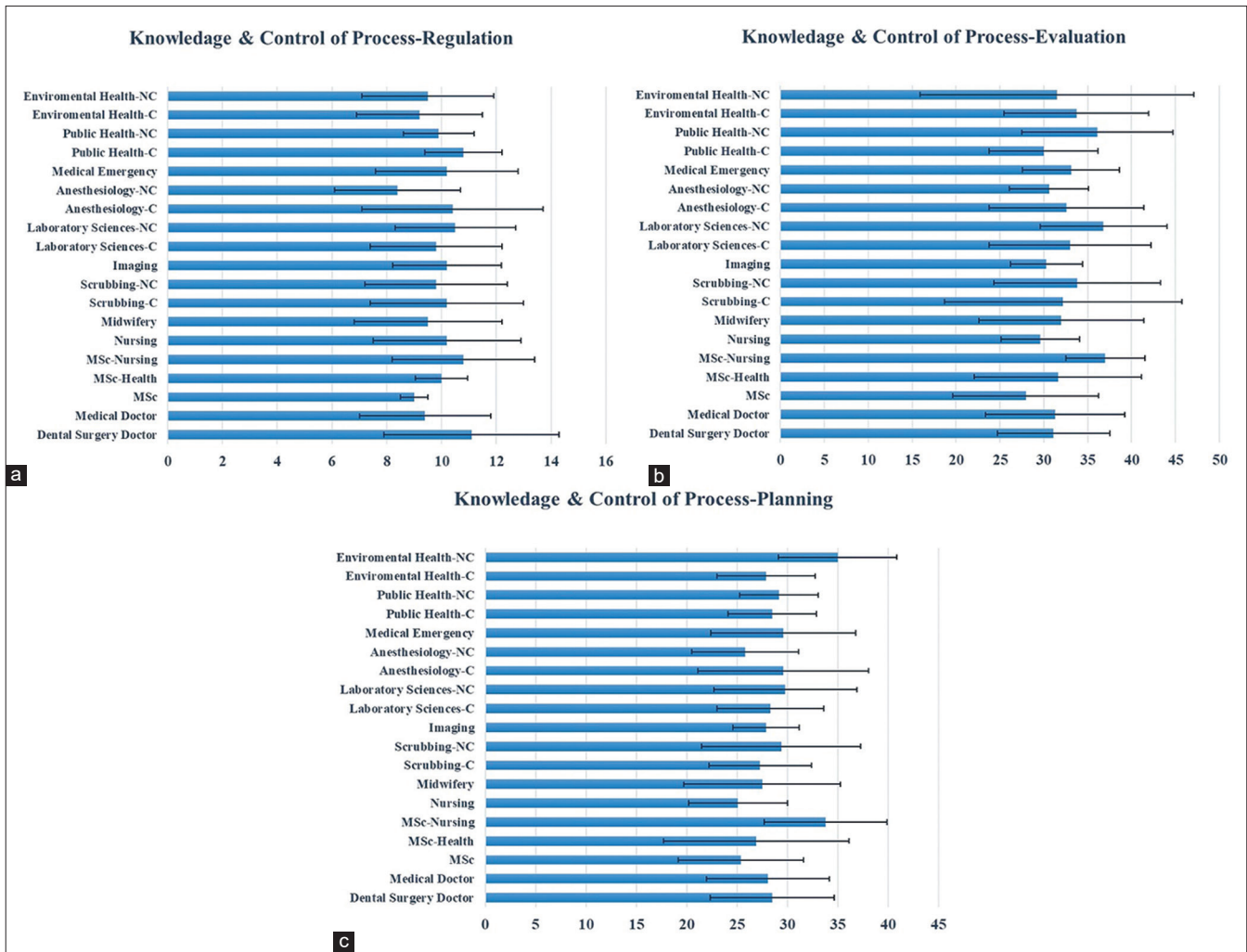


Figure 6: Impact of academic discipline as an academic factor on knowledge and control of process regulation (a), knowledge and control of process evaluation (b), and knowledge and control of process planning (c). Data are presented as mean ± SD

performance in 1200 Nigerian students, whereas<sup>[27]</sup> Umar and Aliyu reported positive impacts of marriage on academic performance in Sokoto Nigerian area.<sup>[28]</sup> Robert *et al.* studied marital status in 374 college students and reported higher grades for married compared to unmarried students.<sup>[29]</sup> Such conflictual results may be related in existent cultural differences, heterogeneity in tests used to assess metacognition and self-efficacy, different level of socioeconomic accommodation, and various educational programs being resorted.<sup>[30,31]</sup>

When it came to the influence of demographic status on metacognitive components, the gender significantly influenced the knowledge and control of process planning in favor of male gender. The age classes significantly influenced knowledge and control of self (commitment, attitudes, and attention) favoring the students of age more than 30 years. The civilian status did not exert any influence on metacognitive components. Accordingly, regulatory metacognitive skills displayed similar mean basic levels among

investigated students in health sciences in respect to demographic status. In contrary to the current findings, Stanton *et al.* demonstrated that regulatory metacognitive skills displayed heterogeneous levels in a group of students at the introductory biology courses.<sup>[18]</sup> Meanwhile, the impact of the demographic status on individualized metacognitive skills was not clearly studied in the available literature.

Concerning the potential influence of academic status (academic degree, school type, and academic discipline) on metacognitive components, the school type influenced knowledge and control of process regulation. The academic discipline significantly affected the global metacognition as well as knowledge and control of self (commitment, attitudes, and attention). The latter could partly reflect the selection process to access the academic discipline based on credential national examination score. The academic status did not in any way impact the level of self-efficacy among students in health sciences.

## Limitations

In spite of the instructional audit undertaking prior to conducting the current study, the observance to study legacy in view of adequately responding questionnaires was the main limiting factor. This study was undertaken among students at a public tertiary university of health sciences in an Iranian province. This study encompasses different socioeconomic levels and reflected heterogeneous scores by the time of national examination, mandatory to entry higher education facilities. Furthermore, this study enrolled participants from different stages of each academic discipline that may not reflect the students' metacognition and self-efficacy at higher education introductory. In addition, the cultural features may impact reproducibility of the current results in other societies with different perceptions and beliefs that do imply further tailored investigations.

## Conclusions

The salient role of metacognition and self-efficacy in efficient learning process remains an ongoing field of interest in educational research. Research-provided information enables to identify students' subgroups, most susceptible to benefit from planning specific educational resources and approaches as to optimally target activation of the metacognitive skills and development of academic self-efficacy. The current study first investigated the impact of demographic and academic status on global metacognition, metacognitive skills, and academic self-efficacy levels among different students in various academic disciplines in health sciences. Although the global metacognition and self-efficacy levels were not impacted by demographic and academic parameters, nevertheless, the metacognitive knowledge and regulation skills were susceptible to be influenced by demographic and academic students' status. The latter should be taken in consideration by pedagogic corpus and educational planners in respect to resort appropriate instructional programs in identified students subgroups. Being aware of possible heterogeneity in metacognitive skills in relation to demographic and academic factors does lead student to seek ways to enhance their learning potential. Focusing efforts on silent implications of metacognition to learning process is recommended by increasing teacher and student apprehension to appropriate supplementary instruction aside conventional academic planning.

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## Conflicts of interest

There are no conflicts of interest.

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