

Dynamics of Attention in Students During the Educational Process

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Abstract

This article investigates the dynamics of attention in first- and second-year university students throughout the academic year. The study was conducted at Qarshi State University and involved a total of 125 students — 27 male and 98 female — divided into first-year (n=63) and second-year (n=62) groups. Attention was assessed using the Schulte-Gorbov table method on the NS-Psychotest apparatus (OOO Neurosoft), which measures the speed and flexibility of attentional switching; results were recorded in seconds, with shorter completion times indicating higher attentional efficiency.

Measurements were carried out at four stages: at the beginning of the academic year (September), before examinations (January), after examinations (February), and at the end of the academic year (May). This longitudinal design allowed the researchers to track the wave-like pattern of attentional changes across the full academic cycle. All tests were administered during morning hours under standardized conditions.

In first-year male students, the baseline task completion time was 55 ± 2.4 seconds, while in female students it was 48 ± 3.4 seconds, indicating higher attentional efficiency in females at the outset. Before the examination session (January), task completion time increased significantly in both groups — to 62 ± 1.8 s in males and 56.3 ± 2.3 s in females — and these changes were statistically significant ($P < 0.05$). After examinations (February), partial recovery was observed in both groups; however, indicators did not return to baseline levels. By the end of the academic year (May), attention efficiency deteriorated again to 62.8 ± 2.2 s in males and 58 ± 1.2 s in females ($P < 0.05$).

A similar pattern was observed in second-year students. Baseline values were slightly higher (i.e., completion times were longer) than in first-year students, suggesting a degree of residual cognitive strain already present at the start of the academic year. The most pronounced change was recorded in second-year female students, whose completion time increased from 50.3 ± 2 s to 63 ± 4 s before examinations ($P < 0.05$). Recovery after examinations was partial, and by May, values remained significantly higher than baseline in all groups ($P < 0.05$ in males; $P < 0.01$ in females).

The results demonstrate that academic workload and examination stress have a measurable and consistent negative impact on attentional performance in university students. The incomplete recovery of attentional indicators between assessment points reflects the cumulative effect of academic stress across the academic year.

Keywords: Attention, Schulte-Gorbov table, academic stress, cognitive functions, university students, examination period, attentional dynamics, adaptation.

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1. Introduction

Students in the higher education system undergo significant psychophysiological changes during their adaptation to the academic process. Adaptation is described as the process by which all systems of the organism reach equilibrium in order to adjust to new conditions and maintain its functional state [8]. For first-year students, the new academic environment, independent lifestyle, and study workloads together act as powerful stressors [3]. In this process, cognitive functions — particularly attention — are recognized as one of the most sensitive indicators for assessing the functional state of the nervous system [5].

Attention is the ability of a person to direct and sustain mental activity toward a specific object, and it constitutes an important foundation for the effectiveness of the learning process [9].

Numerous studies have demonstrated that academic stress has a specific impact on attentional efficiency. For instance, it has been established that working under constant stress worsens attention, among many other cognitive functions [7]. A study by Li et al. showed that under stressful conditions, attention and working memory change in an interrelated manner [5]. Some studies have also noted that chronic academic stress may improve attentional control to a certain degree. However, the majority of researchers emphasize that a sharp increase in stress decreases attentional efficiency [4].

Serious attention must be given to the issue of cognitive load when studying attention in students. A study by Taylor et al. demonstrated that excessive load during the academic process reduces attentional resources and negatively affects learning outcomes [6].

The influence of gender on changes in attention during the academic process is distinctive. A number of studies indicate differences between genders in the speed and stability of attention. According to the results, attentional efficiency in women is slightly higher than in men, although this difference may change under the influence of stress [5].

Broad-scale reforms aimed at improving the quality of

education are being implemented in our Republic. The development of education and more effective organization of student activities have become pressing concerns at the state level. Ensuring optimal adaptation of students to the academic process has been set as a priority task [1]. Nevertheless, there are still insufficient studies on the regular monitoring of cognitive functions — particularly attention — in students throughout the academic year. Existing research is often limited to one-time measurements, and the results do not fully reflect the dynamic changes occurring in students. Taking these considerations into account, we undertook a study of attention dynamics in students during the academic process.

2. Methods

In our study, the dynamics of attention in 1st- and 2nd-year students throughout the academic year were examined using the Schulte–Gorbov table on a modern psychotest apparatus (Neurosoft). The Schulte–Gorbov method is a widely used, standardized technique for objectively assessing the speed and stability of attention. It measures the switchability of attention — i.e., the speed of attentional shift — with results expressed in seconds. The shorter the time required to complete the task, the higher the assessed attentional efficiency [2].

The study was conducted in 4 stages: at the beginning of the academic year, before examinations, after examinations, and at the end of the academic year. A total of 125 participants were examined, including 27 male and 98 female students (63 first-year and 62 second-year students). Examinations were carried out in the morning hours. Prior to testing, participants were informed about the content, purpose, and correct procedure for completing the task.

During the task performed with the Schulte table, the visual search process, working memory, and mental arithmetic are activated simultaneously, which increases the method's value as a tool for complex cognitive assessment [1].

3. Results and Discussion

The findings of the study are presented in the following tables.

Table 1.

Dynamics of attention changes in 1st-year students (seconds)

No.	Study group	Research stages			
		Beginning of academic year September	Before exams January	After exams February	End of academic year May
1.	Males, n=15	55±2.4	*62±1.8	58±2.2	**62.8±2.2
2.	Females, n=48	48±3.4	#56.3±2.3	53±1.4	##58±1.2

*Note. P<0.05; the January result is statistically significant compared to September.

**Note. P<0.05; the May result is statistically significant compared to September.

#Note. P<0.05; the January result is statistically significant compared to September.

##Note. P<0.05; the May result is statistically significant compared to September.

Table 2.

Dynamics of attention changes in 2nd-year students (seconds)

No.	Study group	Research stages			
		Beginning of academic year September	Before exams January	After exams February	End of academic year May
1.	Males, n=12	61.5±2.6	65±1.8	62±2.1	*68±2
2.	Females, n=50	50.3±2	#63±4	56.5±2.7	##60.5±2.7

*Note. P<0.05; the May result is statistically significant compared to September.

#Note. P<0.05; the January result is statistically significant compared to September.

##Note. P<0.01; the May result is statistically significant compared to September.

In the first stage of the study — at the beginning of the academic year — the task completion time for 1st-year male students was 55±2.4 seconds, and for female students 48±3.4 seconds. It is evident that attentional efficiency is higher in females. This difference may arise from neuropsychological characteristics between the sexes. Before examinations (Stage 2), the aforementioned indicator increased to 62±1.8 seconds in males and 56.3±2.3 seconds in females, and these changes were statistically significant (P<0.05). That is, a noticeable decline in attention was observed in both groups as a result of the ongoing academic process. This situation is explained by

the excessive strain on the nervous system during exam preparation.

In the 3rd stage — after examinations — the attentional indicator for males was 58±2.2 seconds (53±1.4 seconds for females). A recovery in attentional efficiency was observed in both groups following the examinations. However, the results in both gender groups did not return to the initial baseline level, indicating that recovery was incomplete.

In the 4th stage of the study, male students completed the attention task in 62.8±2.2 seconds, and female students in 58±1.2 seconds (these changes were statistically significant,

$P < 0.05$). The decline observed in May is assessed as being related to cumulative mental fatigue — that is, fatigue accumulated over the second half of the academic year — and preparation for the upcoming examination session.

Table 2 presents the dynamics of attention changes in 2nd-year students. In the 1st stage of the study, the time spent completing the attention task was 61.5 ± 2.6 seconds for males and 50.3 ± 2 seconds for females. Compared to 1st-year students, attentional efficiency in 2nd-year males at the beginning of the academic year was slightly lower. This situation suggests that even at the beginning of the academic year, 2nd-year students already experience a certain degree of functional strain.

In Stage 2 (before examinations), task completion time increased to 65 ± 1.8 seconds in males and 63 ± 4 seconds in females. After examinations, the indicators improved to 62 ± 2.1 seconds in males and 56.5 ± 2.7 seconds in females, respectively. Although the recovery was noticeable in both groups, it did not return to the initial September baseline. This result is consistent with the recovery dynamics observed in 1st-year students.

In the 4th stage of the study, the speed of attention in males equalized to 68 ± 2 seconds, and in females to 60.5 ± 2.7 seconds; these results were statistically significant compared to September.

A general comparison of the results obtained across both academic years revealed several important patterns. First, in all groups, attentional efficiency followed a wave-like dynamic throughout the academic year: deterioration before examinations, partial recovery after examinations, and a renewed deterioration at the end of the academic year. Second, at the beginning of the academic year, the attentional efficiency of female students in both years was higher than that of male students. Third, the recovery process in the participants was incomplete, and this situation is considered an objective indicator of the cumulative mental fatigue accumulated during the academic process.

4. Conclusion

Cognitive functions in students change throughout the academic year under the influence of various factors. Cognitive indicators such as attention and memory, which are at a high level at the beginning of the academic year, decline significantly under the influence of academic workloads, various assignments, students' personal motivations, and other factors. On the eve of examinations, these indicators rise to higher levels, only to decline again

under the influence of mental workloads in the second semester. At the end of the academic year, a renewed improvement is observed. It can be stated that such dynamics define the adaptation of students to the academic process. As a result of this adaptation, cognitive functions in 2nd-year students do not change dramatically throughout the academic year. The observations and examinations we conducted confirm this conclusion to a certain degree.

The preliminary results obtained scientifically substantiate the necessity of regularly monitoring students' cognitive functions and effectively distributing academic workloads in higher educational institutions.

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